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EDITORIAL

AN EPITOME OF THE HISTORY OF SPANISH MEDICINE.[1]

The status of Spanish medicine, as of Spain itself, in relation to Europe, turns upon the physical geography of the country, its peculiar isolation by sea and Pyrenean mountain-walls, and the isolation of its different provinces from one another by physical barriers of the same kind. Apart from the work of the great histologist Ramón y Cajal, Spain has left no appreciable mark upon European medicine, no such influence (shall we say) as that of Spanish fiction upon the French and English novel of the 17th-18th Centuries, of Calderon upon Shelley, of Velázquez upon Whistler or of Goya upon the whole range of recent fantastic and realistic art. Yet, during her Golden Age (1516-1700), Spain was one of the greatest colonizers the world has known, in Velázquez she produced the greatest painter who ever lived, and, as we shall see, her output in medicine during 1500-1700 holds its own with any other European country except Italy in the 16th Century and England in the 17th. Taken by and large, the medicine of Spain was, and still is, virtually the medicine of South America, Mexico, Central America, the Antilles, the Philippines, Portugal, Goa and parts of North Africa. In her power to assimilate native races to herself, Spain was a more efficient colonizer than Rome or England, actually getting inside their skins and making them Spanish at heart and in

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modes of thought. Rome, England, Prussia could impose laws and uphold government, but Rome could not change the essential nature of the Gaul, the Teuton, the North African or the Jew; England could not make Englishmen out of Hindus or Australian aborigines, nor could Spain, in the days of her might, turn Neapolitans and Sicilians into Spaniards. Her influence upon native races was more pervasive and intangible, like that of the Greeks upon the peoples of Egypt or of the littoral of Asia Minor. When Blasco Ibañez asserted that Spain has no further need of colonies, since their peoples have all become her spiritual children, the assertion met with no particular comment, for all recognize it to be the truth.

The history of Spain and of Spanish medicine goes back to palæolithic times. The Iberian peninsula, surrounded by the Atlantic and the Mediterranean and shut off from France by the Pyrenees, was once continuous with Africa, and, as some enthusiasts conjecture, even with America. From the heights of Castile and Estremadura falls a slope which is abrupt toward the Mediterranean, gentle toward the Western ocean. These gradients are criss-crossed by smaller cordilleras and plateaus, separating Spain from Portugal, old Castile from New Castile, Castile and Estremadura from Andalusia, while Aragon, Catalonia, Valencia and part of La Mancha form the narrow littoral on the Mediterranean (Northern) coast. The valley of the Ebro lies in Aragon and Catalonia and between the Ebro and the Guadalquivir is a tableland of huge dimensions. Over this well ridged and well-rivered peninsula, there passed, in due process of time, the usual succession of domineering or dominating races—Iberians, Celts, Phœnicians, Visigoths, Romans, Moslems, with constant insurrection of groups of subjugated peoples, with natural coalition of adjacent kingdoms or the inevitable secession from such mergers, until finally the Moslem yoke is thrown off and Spain stands forth as an independent, individualized nation, through the union of Castile and Aragon under Ferdinand and Isabella in 1479. So England was formed out of the Saxon heptarchies, so modern France, Italy and

Russia were formed, so the Germany of 1870 was formed and so our own country was federalized and unified after 1865. In the view of Humboldt, the initial primitive Celt-Iberian stock was autochthonous, aboriginal, of the soil. In the view of Leibnitz, Niebuhr and Haeckel, they were a Hamitic-Semitic race of North African origin, *colorati vultus et torsi plerumque crines,* like the Sicilians in Tacitus. The longish skulls, the similarity in language and primitive tribal organization, point to a close relationship with the Berbers, Touaregs, Copts and Kabyles of the North African littoral and desert. The Spanish Basques west of the Pyrenees are dolichocephalic; the French Basques brachycephalic. The Touareg suffix *tani* is common to the Roman geographical designations Lusitania (Portugal), Gaditania (Cadiz), Mauritania and, as stated, the Iberian peninsula was once continuous with Africa Minor. The carvings, rude line engravings and mural paintings of this prehistoric Afro-Semitic race constitute the finest and most instructive survival known to us of palæolithic art. In the caverns of Cogul (Lerida), Alpera (Albacete) and Almeria are fresco paintings and etchings on stone or bone, which are so accurate and realistic that the animals are identifiable as to species and the human figures are perceived to be almost identical as to costume and physical habitus with those of Crete. As in the case of Egypt, this strong grip upon reality vanishes in the neolithic art of Spain, which is decadent and remarkable only in respect of decorative pattern work and ornamentation.[2] The primitive inhabitants, both of Spain and the Canary Islands, were indubitably of the Crô-Magnon type. There is no evidence of the existence of Neanderthal Man. The West and the Northwest (Galicia and Portugal) was settled by the Celts, the Iberians occupying Eastern and Southern Spain, while in the center the Celt-Iberian mix-

[2]The observation of anthropologists is to the effect that palæolithic art, like that of the savage, the child and the insane, is animistic, ideographic and realistic, while the inevitable tendency of neolithic art toward pattern work and formal, but lifeless perfection, is a natural consequence of development of the science of measurement, e. g. in the designs of pottery, textiles, architecture and other metric and geometric arts.

ture came to pass. The provinces, such as Lusitania or Galicia, were local federations of 30-40 tribal groups. The Phœnicians came into Spain in the 11th Century B. C., attracted by the mineral wealth (silver, copper, mercury). They called the peninsula *Span* or *Spania* (the hidden land). The Greeks came in on the northeastern coast (630 B. C.) and have left the earliest accounts of the country (6th Century B. C.). The Carthaginians came in on the eastern seaboard a century later. During 236-206 B. C., Spain was in the hands of the Barca *gens*. Hamilcar Barca gave his name to Barcelona, on the northeastern coast, while his son-in-law, Hasdrubal left another mark of Carthaginian occupation further south, in the name of the capital, Cartagena. In 206 B. C., the Carthaginians were ousted by the younger Scipio and the Romans occupied Spain during the next six centuries (206 B. C.-409 A. D.). They left their mark in better laws, better administration, in the remains of the great walls, public works, amphitheatres and aqueducts (Segovia, Tarragona), in the structure and etymology of the Spanish language,[3] in the well-made military roads, in the expansion of commerce, in long periods of peace which insured the growth of wealth and culture, and in the development of the best type of citizenship. Some of the mildest and greatest of the Roman emperors, Trajan, Hadrian,[4] Theodosius, were all of them born at Italica, near Seville, and Marcus Aurelius was of Spanish descent. Augustus Caesar, who put his Spanish freedman, Hyginus, in charge of the Palatine Library, was once at Tarragona, where he was cured of a liver complaint by Antonius Musa. To the Roman literature, Spain contributed Martial, Lucan, Quintilian, the Senecas, Columella, Pomponius Mela and Juvencus. Among the medical men, the anatomists Mustio and Vindician and the physicians Cassius Felix, Theodorus Priscianus and Caelius Aurelianus were Numidians or "little

[3]Thus Zaragoza derives from *Caesaria Augusta,* Merida from *Emerita Augusta,* Badajoz from *Pax Augusta,* Astorga from *Asturica Augusta,* León from *Urbs Septima Legionis,* etc.

[4]Author of the *Animula vagula blandula* verses.

Africans" (from Africa Minor). By the 3rd Century A. D., there were many Christian communities in Roman Spain. St. Damasus (304-384), thirty-sixth in the line of Roman pontiffs, who inspired St. Jerome to translate the Bible, was of Spanish origin. Prudentius and Orosius came from Tarragona, Priscillian from Cordova, Theodolphus, author of the Palm Sunday *Gloria,* was Spanish born, and several martyrs of the Church, such as San Vicente of Valencia, Santa Eulalia of Merida, San Severo of Barcelona, Santa Leocadia of Toledo and Santa Engracia of Zaragoza, were put to death under Diocletian. At the beginning of the 5th Century, A. D., the Vandals swarmed into Spain to occupy Andalusia (Vandalusia or Vandal-Land) and were followed by the Visigoths, who dominated the country for three centuries (409-713). The principal relic of their occupation is the Visigothic Code (*leges barbarorum*), which contains certain rigorous prescriptions touching medical fees, punishment for malpractice and the reciprocal rights of physician and patients, not unlike those in the Code Hamurabi. The Visigothic Code was later combined with certain juridical principles enunciated by Isidore of Seville, to form the Spanish Magna Charta (*Fuero Juzgo*). The Romans held on until the Visigothic King Theodoric made a definite split with the Western Empire in 476. Toledo became the Visigothic capital during the reign of Athanagild (554-567) and about 587-589, the Visigoths were converted to Catholic Christianity. In the 6th Century, a Cæsarean section was performed by Bishop Paul of Merida (530-560) and a hospital was founded in the same city by Bishop Masona in 580. The most important figure among the Spanish clergy was Archbishop **Isidore of Seville** (570-636), whose statue stands in front of the National Library at Madrid beside that of Alphonso the Wise, and whom Sudhoff defines as "the true stepping stone to Spanish science and medicine in the Middle Ages." Like Cassiodorus and Boethius, Isidore was a man of vast learning, author of an universal history, a history of the Visigoths, Vandals and Suevians, lives of illustrious men, and the *Etymologia,* or encyclopædia of origins and ety-

mologies, which sums up all the knowledge of antiquity. The fourth book is devoted to medicine and derivations of medical terms. To the *Fuero Juzgo* or Spanish Charter, (*Forum Judicium*), Isidore contributed the doctrines of the divine right and hereditary succession of kings and the duty of the State to protect the Church, as the best means of insuring peace and tranquility in these troublous times.

During the long period of Moslem domination (711-1276), there was constant warfare, but the intervals of peace were far more frequent than during the period of struggle for national unity (1276-1479) and in these intervals, Christian, Moslem and Jew managed to subsist side by side without any apparent friction, like the wild animals at railhead in Uganda. The unitarian, standardizing mania of Islam was, in theory, at least, a species of theological Sovietism, but the real object of the emirs was conquest as a pathway to pleasure, with monotheism as a stalking horse. The Arabs themselves were sceptical, materialistic, indifferent, pleasure-loving, polygamous, sometimes atheistic, fonder of music, dancing and erotic poetry than of orthodoxy and devotion. Like all converts to a creed or a social code, the Berbers and other North African tribesmen were inevitably more fanatical than those born and bred in the faith. Arab military expeditions were usually forays for plunder and once the booty was secured, religious toleration was the rule. Christians acclimated to Moslem rule (Mozarabs), Moslems living under Christianity (Mudéjares) and Jews were, in fact, better treated by Islam than were the converted Jews (Maranos) and converted Moslems (Moriscos) under Christianity in the later period. Christian and Moslem observed the same holy days, and, in one instance, worshipped in separate halves of the same church. The Jews, under stress of the Visigothic penal code, went over to the Arabs, and became prime movers in the intellectual predominance of Cordova and Toledo. Again, the Arabic community was always tribal (*taifa*), sometimes nomadic. Alliances and allegiances were impermanent, often fitful and irresponsible. The whim of joining up with one's enemies, to help

them out in a tight place or against some hated rival, was as common to Christian or Moslem chieftains as it is to "the indifferent children of the earth" today. Ruy Diaz, far from being the noble, impeccable Christian warrior of tradition, ever crusading against the Paynim, was actually banished from Castile by Alphonso VI for theft of funds, sold himself on occasion to any highest bidder, got his romantic title of Cid (Lord and Master) from his Moslem employers, and, in 1086, appeared with a mixed horde of Christians and Moslems to dispossess the Moslem overlord of Valencia. When Ferdinand II (San Fernando) of Castile was invited by Louis XI to join the Crusades, he replied: "There are plenty of Moors in my own country." Single-minded fanaticism was confined to the Almoravides (religious men) or Berber converts of the Sahara, and to their opponents, the Almohades or unitarian Moors of Morocco. Under the tolerant Arab sway, literature, art, science and philosophy were permitted to flourish, hospitals and libraries were built, schools and scientific societies were founded, agriculture and industry were organized, and by the 10th Century, when the nomads became sessile and stabilized, Moslem Spain, and its capital Cordova, were credited with untold wealth. Apart from the mathematics and polite literature, the Moslems were assimilators and transmitters rather than innovators. Their architecture (domes and decorated flat surfaces) derived from Byzantium. The *patio* or enclosed court of their houses came from Rome. Their medicine was but a diluted or debased strain of Greek medicine. The Moslems were, nevertheless, the principal transmitters of ancient Greek and Byzantine Greek culture. The handy Arabic numerals made arithmetic (algorythmics) possible, the Moslems forwarded algebra as well as the Egyptian tradition of chemistry (alchemy) and one of their great physicians, Avicenna, was the founder of geology. To the comforts and luxuries of life the Arabs added cultivated plants and drugs, spices and perfumes, gardens, street-lamps, window-panes, fireworks, under-garments, morning and evening serenades with stringed instruments. The

great physicians of the Western Caliphate (655-1236)—Albucasis, Avenzoar, Averroes and Moses Maimonides—were all born at (or near) Cordova, but they are regarded by the Spanish historians as part and parcel of Islam or Israel, not germane or essential to the development of Spanish medicine in the Age of Gold. Beyond a few, fugitive and fragmentary strains of Mozarabic melody, monotonous and fitful as the crooning of a negress at a clothes-line, the Moslems left no appreciable influence on the national music of Spain, which is *sui generis*. One of these Mozarabic chanties, *Qualbi qualb' Arabi qualb' Arabi* ("My heart is the heart of an Arab") suggests the fact that the nomad warriors of the desert did not, like the Visigoths, bring their families with them and so intermarried freely with the Christian women. The main area of this racial inmixture of Celtiberic, Visigothic and Afro-Semitic strains was Andalusia (at the South) and through the fact that the Spanish colonization of the Western Hemisphere was accomplished mainly by Andalusians, sailing from the convenient ports of Cadiz and Seville, the effect of this Arabic racial ply upon national character was to be most decisive among the peoples of the New World.

To the North of the Cordovan Caliphate, which, during 910-1037, embraced most of the Iberian peninsula, lay the Visigothic kingdoms of Asturias, Leon, Castile, Navarre and Catalonia (Barcelona) and of these, the mountainous border state of Asturias was the center of continual revolt from the Moslem yoke from the start. The frontier was South of the Douro River and Aragon was in the enemy domain. By 1150, this frontier has been pushed southward to the Tagus River and by 1276, all that remained of Moslem Spain was the tiny seaboard kingdom of Granada, facing Africa. The Catalans on the northeastern coast, like their forebears, the Carthaginians, are the natural business people of Spain, and have been in continual revolt against constituted authority from the earliest times. The recent revolution (1931) and their part in it, was inevitable and not surprising.

In the long struggle for a united, independent Spain, the Benedictine monks of Cluny, who came into Castile in 1033, were an important agency in activating the Catholic monarchs to the task of reconquest. There is no evidence extant of charitable medical aid in the Spanish medical cloisters before the advent of these Benedictines, who were the special creation of Charlemagne himself. In the cloister of Victoria and Emilia, there were books of medical recipes, like those of Western Europe in the 8th-9th Centuries, the oldest of these coming from the Pyrenean cloister of Ripoll, near Gerona, which was founded in 820 and existed up to the beginning of the 19th Century. Some two-thirds of these MSS. were found by Sudhoff[5] to be in the Royal Aragonese Archives at Barcelona. The oldest is a codex of the 8th-9th Century, comprising a recipe book, with therapeutic applications at the top of the page, an *Antidotarius* (collection of magistral formulæ) and a *Passionarius* (descriptions of diseases), with sundry Salernitan estrays. Some decades before the enfranchisement of the Ebro Valley, Toledo was already under home rule (1085). Its mosque was full of costly Arabic MSS. and it was soon to eclipse Cordova itself in medicine, philosophy and theology and as a center of social life. Here, then was the natural clearing house for Latin translations of the Arabized Greek texts of the Moors, of which the best came from Irak. The Latin paraphrase of the hygienic epistle of pseudo-Aristotle to Alexander by the Marano, Ibn Dawud or **John of Toledo**, became widely known all over the West and was dedicated to Princess Tharasea, daughter of Alphonso VI. About 1180, this fragment, enucleated from the *Secreta* of Aristotle, became the original of the *Regimen sanitatis* of Salerno. At this time, as shown by Steinschneider,[6] the Jews were the natural interpreters in these translating activities and the

[5]See his inventory of the MS. literature in *Spanische Forschungen d. Görres Gesellsch.* Münster i. Westfalen, 1930, II, 178-184.

[6]M. Steinschneider: *Die hebräischen Uebersetzungen des Mittelalters und die Juden als Dolmetscher.* 2 v. Berlin, 1893. *Die europäischen Uebersetzungen aus dem Arabischen.* Vienna, 1904-5.

Mozarabs were as helpful as the Jews. Arabic was actually spoken by learned Spanish Jews up to the 13th Century. This translating movement at Toledo, fostered by Archbishop Raimundo, Archdeacon Gondisalvo and others, eventually centered around Gerard of Cremona (1114-87), who came there from Italy to get a translation of Ptolemy's *Almagest* and thus started a school of translators which was active to the end of his life. Of 71 books translated under Gerard's direction, 28 were medical. Gerard is also said to have lectured in the Capilla de la Trinidad of the former Mesquita, but there is no evidence to this effect nor is any surviving MS. of Gerard to be found in the Biblioteca capitolar (Sudhoff). About 1212-14, Alphonso VIII of Castile founded the first Spanish university at Palencia, where a hospital had been established by the Cid in 1067. The University of Salamanca was founded by Alphonso IX of León in 1215, but not confirmed until 1243 (by Ferdinand III and later by a Papal bull of 1255). Universities were also planned at Lerida (1300) by Jaime II, at Valladolid (1346) and at Huesca (1354). In 1255, Alfonso X (the Wise) obtained from Alexander IV a bull founding an Academy of Medicine, at which Cordovan and Toledan physicians gave instruction based on the *Canon* of Avicenna and the *Colliget* of Averroes.

In the 12th Century, refuges were founded in Zaragoza for pilgrims, sick people and lepers. Similar institutions followed in many other cities. The leading medical figures of the time were the alchemist Ramon **Lull** (1235-1315) of Mallorca, who left an unpublished *Ars medicinae,* with astrological figures, now in the Library of the Escorial; **Arnold of Villanova** (1235-1315) of Catalonia, who wrote the famous commentary on the *Regimen Sanitatis* of Salerno, and Pope John XXI (**Petrus Hispanus**), who wrote on medicine (*Thesaurus pauperum*) and came to a tragic end at Viterbo in 1277. Sudhoff[7] states that the great Salernitan surgeon Theodoric, pupil of Hugh of

[7]Sudhoff: *op. cit.*

Lucca, may also have been a Catalan. Jean **Jasme** de Agramont (Johannes Jacobi) of Lerida wrote a pest tract in the Catalan dialect (1348), which bears some relation to the incunable of Johannes Jacobi or (Canutus) Klebs. Micer Johan, author of a *Llibre de receptes* was probably Juan de Valencia, physician to Alphonso I. A fragment of a medical MS. of 1381 by Estefano, physician to Bishop Don Pedro of Seville, is in Madrid (Sudhoff). Raimondo de **Sabunde** [-1432], of Barcelona, professor of medicine at Toulouse, was the author of *De natura hominis* (Cologne, 1501) and of a defense of Christian doctrine (*Theologia naturalis*), which Montaigne translated (1569) and defended in one of his Essays (II, 12).

The Fifteenth Century.

The period of struggle for national unity (1252-1479) was characterized by the ascendancy of towns and town life, the inevitable struggle between the principle of unification (vested in the King) and the decentralisation implied by the growth of power in towns and among the nobility, who, then as later, were "rich men" (*ricos hombres*) possessing broad estates (*latifundia*). The chief agents in this policy were Alphonso X (1252-84) called the Wise, and his great grandson Alphonso XI (1352-84). By the end of the 15th Century, the weak rulers who preceded Ferdinand and Isabella were apparently defeated, but, in reality, the power of the nobles was destroyed and monarchy was triumphant. At the same time, more power had been gained by the legislative bodies (*Cortes*) and the officialdom (*adelantados*) of the different capitals, and such Moorish survivals as the civil marriage (*á yurgas*) and the common law or bargain marriage (*barraganía*) were giving way to marriage by religious sanction (*benedición*). The legal obligation of proving that one's progenitors had no taint of Moorish, Jewish, heretic or infidel blood (*limpieza de sangre*) was not abolished until 1835.

During the 15th Century, **universities** were founded at Barcelona (1450), Zaragoza (1474), Mallorca (1483) and

Alcalá de Henares (1499), which, as being near Madrid, soon became a rival of Salamanca itself. It was richly endowed by Cardinal Ximenez in 1510, and three centuries later, was merged into the University of Madrid. In 1422, Juan II created a Tribunal of Alcaldes and Examiners to ascertain the competence of applicants for the right to practice medicine. The duty of examining physicians and surgeons to the king and the nobility was assigned to *protomedici,* of whom Alfonso Chirino and later Fernan Gómez were the first. These privileges of the "Protomedicate," dating from 1422, were confirmed by a law of March 30, 1477. So great were the privileges accorded physicians that they were protested against by the Cortes at Zamora (1432) and Madrigal (1438), but nevertheless reaffirmed by royal ordinances of 1435 and 1438, in virtue of which, no civilian or other authority could interfere with the business of the Protomedicate Tribunal. Spanish physicians, in fact, had a special tribunal of justice of their own from the start (1422), while the Royal Councils and Chancelleries of Valladolid, Madrid and Granada were not created until 1442, 1494 and 1505 respectively, the Council for the Indies in 1511 and the Tribunal of the Inquisition in 1483. **Insane asylums** (*casas de orates*) were founded at Valencia (1500), Zaragoza (1425), Seville (1436) and Toledo (1473). During the epidemic of plague in 1474, quarantine was established at Mallorca. Leper houses were established in great numbers and under direction of special officials (*alcaldes de lepra*). In 1240, Ferdinand III established a chair of **anatomy** in the University of Palencia, which was transferred to Salamanca by Alphonso the Wise. Dissection was done outside the city limits, usually in cemeteries. But progress in anatomy was not great and the physiology of the period was entirely Arabist. **Surgery** was in the hands of barbers, and Salamanca students practiced bandaging upon an articulated mannikin up to 1490, when Antonio Amiguet and Juan Vals established a school for technical instruction in surgery. The only text of consequence was a kind of hornbook of surgery in

rhyme (*Cirugia rimada*) by Diego Cobo (1412). Military surgery was forwarded by the service of **camp hospitals** and **ambulances** instituted by Queen Isabella during the expulsion of the Moors from Granada. Six large hospital tents were in evidence at the siege of Alora (1484) and four at the siege of Baza (1489). Wagons provided with beds appeared at the siege of Otrera (1477-8) and no less than 400 of these ambulances were employed after the capture of Malaga (August 19, 1487), as attested by Hernando del Pulgar (1484), Pedro Bosca (1487) and Peter Martyr (1489).

The materia medica of the New World was described by Diego Alvarez Chanca, who accompanied Columbus on his second voyage and by Rodrigo Fernández. Alfonso Chirino, physician-in-chief to Juan II, published in 1447 a MS. *Espejo de la Medicina,* which professed to standardize prescriptions but in reality exploited very complicated ones (Sudhoff). Of much more historic and bibliographic interest are the Spanish medical incunabula, catalogued by Konrad Haebler (1903-17) in particular the pest-tracts. The art of **printing** was introduced into Spain by the German Lambert Palmar, who published *Obres e trobes en lahors de la verge Maria* by Bernardo Fenollar at Valencia in 1474. The finest specimen of Spanish medical printing is probably the black letter translation of Lanfranc (*Cirurgia menor*), printed at Seville *por tres Alemanes compañeros* on May 15, 1495. As catalogued by Arnold Klebs, the Spanish **pest-tracts** are: the *Eclipse del Sol* of Diego de Torres (Salamanca, 1485), the *Regimen* of Luys Alcanys (Valencia, 1490), the *Aggregator* (Rome, 1499) of Pedro Pintor of Valencia, physician to the Pope Alexander VI; and the *Regimiento* of Fernan Alvarez (Salamanca or Barcelona, *circa* 1500). The Latin pest-tract of the Portuguese Valesco de Taranta (Padua, 1473) was translated into Spanish and printed at Barcelona (1475), Burgos (1495) and Pamplona (1495). The tract on syphilis by Gaspar **Torrella** of Valencia, physician to Alexander VI and Julius II, was published at Rome in 1497 and dedicated to Caesar Borgia, at that time Cardinal

Deacon of Valencia. It sounds an alarm over the accidents produced by salivation from mercurials, to which the death of Alfonso Borgia was attributed. In the second edition, printed at Blois (1499), small doses are recommended. Torrella, who afterwards became a Bishop, assisting at the Fifth Lateran Council, also wrote *Consilia* (1521) on the epidemic fever brought into Vizcaya in 1505 by the squadron of Flanders, which caused a mortality of 6000 in the northern province and spread all over Spain.

The Golden Age

The stretch of time covered by the reigns of Charles V and the three Philips (1516-65) is called by Spanish historians the *Siglo de oro,* their Golden Age. It was ushered in by such stirring events as the unification of Castile, León and Aragon under Ferdinand and Isabella, the conquest of Granada (1492) and the opening up of the New World by Columbus in the same year. In this period, Spain attained her height of military and naval prowess in Alva's campaigns, in the conquest of Mexico and Peru by Cortez and Pizarro and at the battle of Lepanto (1571). A little later, El Greco, Velázquez, Cervantes, Lope de Vega and Calderon gave her a position in art and letters second to none. The seeds of dissolution were already sown in the incursion of Ferdinand into Italy (1497) and the imperialist policies of Charles V and Philip II, which embarked the nation upon two centuries of meaningless wars, and depleted the enormous revenues derived from the colonies.[8]

In the 16th Century, Spain produced a number of physicians who were not without credit and renown among the anatomists, surgeons, obstetricians, medical scholastics and medical philosophers of the period. No less than Vesa-

[8]The annual revenues of Spain under Philip II have been estimated at 24 billion ducats or $360 billion, of which about one-half reached the national treasury, while the national debt left by the monarch was $1½ billion. By 1600, the revenues were about $270 billion, of which one-third was available, and the national debt in 1690 was still over a billion dollars. The purchasing power of these vast sums was far greater then than now.

lius was attached to the Spanish court from 1543 to the end of his life (1564) and Spanish anatomy was influenced by the *Fabrica* (1543) and its illustrations. Prior to Vesalius, Andrés **Laguna** (1494-1560), a medical graduate of Salamanca, who taught at Paris, Alcalá, Toledo and Bologna, published a book on anatomical method (dissecting) in 1535 and Luis **Lobera de Avila** a *Libro de Anatomia* (Alcalá, 1542). The chair of anatomy at Valladolid (*circa* 1550), the third in Europe after Bologna and Montpellier, was first held by Alonso Rodríguez de Guevara, a skilful prosector trained at Bologna, who did much to interest students in the subject and published a treatise at Coimbra in 1559. This was preceded by the *Anothomía del hombre* (Valladolid, 1550) of the Catalan anatomist, Bernardino Montaña de Monserrate, and followed by the well-known *Historia de la composición del cuerpo humana* (Rome, 1556) of

Juan **Valverde de Hamusco,** a pupil of Columbus and Eustachius at Padua, who became physician to Pope Paul IV. An Italian translation of this work was printed at Rome (1560) and reprinted at Venice by the Giunti (1586). A Latin translation of the explanation of the plates was printed by Plantin at Antwerp (1566) and reprinted by him in 1568, 1572 and 1579, as also a Dutch translation (Antwerp, 1568), reprinted at Amsterdam (1647). A complete Latin translation by Columbus was published by the Giunti (Venice, 1589) and reprinted in 1607. Italian translations of the Columbus version appeared at Venice in 1606 and 1682. The drawings, some of which derive from Vesalius, were made by the painter Gaspar Becerra and engraved by Nicolas Beautrizet, but as Choulant points out, the book contains several illustrations not in Vesalius. The description of the muscles of the eye is better, the small descending apophyses of the lumbar vertebræ are described for the first time and the nerves are conjectured to have a sheath, "like the bark of a tree."

From the Valencian school came Pedro **Gimeno,** a pupil of Vesalius (Padua) and Jacobus Sylvius (Paris), who published an exact description of the *stapes* as the "delta" (1549)[9], which brought him into violent controversy with another Valencian anatomist, Luis Collado, who defends his master Vesalius in a commentary on Galenic osteology (1555).

An important work on **artistic anatomy** (human proportion)was the *Varia commensuración* (Seville, 1585) of

[9]Pedro Gimeno: *Dialogus de re medica,* Valencia, 1549, cited by Garcia del Real.

the sculptor and goldsmith Juan de **Arfe** y Villafañe (1535-), of Leon, who acquired a great reputation as the fabricator of the hosts and other altar objects in Spanish cathedrals and churches. To this group of artist-anatomists belong also Alonso Berrugueste (1480-1561), Gaspar Becerra (1520-70) and Luiz de Costa (1599-), who translated Dürer's book on human symmetry into Portuguese. As **precursors of Harvey,** Lobera (1542), Sanchez Valdez de la Plata (1545), Bernardino Montaña de Monserrate (1551), Juan Calvo (1596) and the veterinarian Francisco la Reina (*Tratado de Albeitería,* Burgos, 1552), theorized about the circulation with an accuracy far in advance of their time and prior to Cesalpinus (1571-93) and the other Italian claimants.

Of the leaders of Spanish surgery in the 16th Century, the earliest and most important is

Francisco **Diaz,** a graduate of Alcalá who studied anatomy under Gimeno and Collado at Valencia, became surgeon to Philip II, published a surgical compend in the form of dialogues (1575)[10] and is memorable as the author of the first treatise on diseases and surgery of the urinary tract (1588)[11]. It contains an account of the high operation for stone, then called the Spanish method, as opposed to the "Neapolitan procedure" of Mariano Santo and explains the use of the urethral sound invented by Alderete.

Andrés **Alcazar,** of Guadalajara, a graduate of Salamanca where he subsequently held the chair of surgery, published a surgical treatise in 1575[12] and invented an apparatus for injecting or evacuating liquids into and from the chest.

Francisco **de Arceo** (1493-1575) graduated at Alcalá, and was a fellow student of the famous ecclesiastic philosopher Arias Montanus (1527-98), who also practised surgery and edited Arceo's posthumous work on the treatment of wounds (1576).[13] This book, which summarizes the experience of 45 years, was translated into English (by John Read, London, 1588), Dutch (1658, 1667) and German (Nuremberg, 1674). Arceo devised a balm called after him and a method of rhinoplasty highly praised by Sprengel, was against the stuffing of wounds with tampons, the abuse of sutures and the impalement of the cancerous breast in its amputation, but advocated bold trephining on occasion.

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[10]Francisco Diaz: *Compendio de cirugia.* Madrid, 1575.

[11]Diaz: ***Tratado de todaslas enfermedades de los riñones, vejiga, carnosidades de la verga y orina.*** Madrid, 1588.

Juan **Calvo**, a graduate of Saragossa and professor of medicine at Valencia, organized an Academy of Surgery in his own home, which drew many pupils. His surgical treatise of 1580,[14] was reprinted five times at Barcelona (1591), Madrid (1626, 1657, 1674) and Valencia (1690), and the section on ulcers was translated into French (Poitiers, 1596). He also published books on syphilis (1592), on internal medicine (1592) and a Spanish translation of the surgical treatise of Guy de Chauliac (Valencia, 1596).

Bartolomé Hidalgo **de Agüero** (1530-97) of Seville, was the first surgeon in Spain to teach the healing of wounds by first intention and became so skilful in wound surgery that duellists commended themselves "to God and the hands of Agüero." He was a voluminous writer, his most important surgical texts being his *Abisos* (1584) and his *Tesoro* (1604), both published at Seville. The latter contains the first Spanish treatise on the eye (*Historia del ojo,* 1586).

Juan **Fragoso**, of Toledo, was physician to Philip II and the author of two surgical treatises, viz., *Erotemas quirúrgicos* (Madrid, 1570) and a *Cirurgia universal* (Madrid, 1581; Alcalá, 1601). He also wrote a book on the officinal materia medica of Spain (Mantua, 1575; Madrid, 1583) and an account of East Indian medicinal plants (Madrid, 1572), a compilation from Garcia ab Orta, Monardes and Clusius, which was later translated into Latin by Israel Spach (Strassburg, 1601).

Dionisio **Daza Chacón** (1503-) of Valladolid, a surgeon in the armies of Charles V, was attached to the Military Hospital at Madrid (1557) and later to the Spanish fleet. He is said to have treated the wound of Cervantes at the naval battle of Lepanto (1574). His Surgical Practice (Valladolid, 1605),[15] reprinted at Madrid (1626) and Valencia (1650), describes his method of treating aneurisms and wounds of arteries by ligation. He was the first to recommend ligation of the tumor in the treatment of nasal polyps.

Perez **Lopez de León** worked under Agüero at Seville and later established himself in Cartagena, where he taught his master's methods. His principal work was a treatise on wound surgery (1628).[16]

All these surgeons were expert in trephining and each had his own particular technique in the treatment of such conditions as cancer of the breast and pleurisy. The first surgical publication to come from the New World was the rare and highly prized *Suma y recopilacion de cirugia* of Alfonso Lopez de Hinojoso (Mexico, 1595).

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[12]Alcazar: *Chirurgiae libri sex,* Salamanca, 1575.

[13]Arceo: *De recta curandorum vulnerum ratione,* 1575.

[14]Calvo: *Primera y segunda parte de cirugia universal,* Seville, 1580.

[15]Daza Chacón: *Práctica y teórica de cirugía en romance, y en latin.* Valladolid 1605.

[16]Lopez de León: *Práctica y teoría de las apostemas.* Sevilla, 1628.

The earliest Spanish works on the hygiene of pregnancy and infancy were those of Damian Carbón (Mallorca, 1541), Luis Lobera de Avila (Valladolid, 1551) and Juan Antonio de las Rueces y Fontecha (Alcalá, 1606). A defense of maternal lactation was published by Juan Gutierrez de Godoy at Jaen in 1529, and a book on children's diseases by Francisco Perez Cascales at Madrid in 1611.

During the 16th-17th Centuries, the bubonic plague ravaged Barcelona, Seville, Valencia, Zaragoza and Valladolid with heavy mortality and there was a goodly contribution to the tractate literature on this theme by Luis de Lucena (1523), Laguna (1542), Lobera de Avila (1542) and others.

Notable were the accounts of the epidemic at Zaragoza in May, 1564 by Juan Tomás Porcel (1565), which contains autopsy protocols; of the Valladolid epidemic by Ponce de Santa Cruz (1601); and of the outbreak at Seville in 1649 by Gaspar Caldera de Heredia (1650), all substantial contributions to the earlier literature of epidemiology. Among the syphilographers were Francisco **Lopez de Villalobos** (1496-), of Valladolid, who published the first poem on lues (*Salamanca,* 1498)[17] and *Las problemas de Villalobos* (1543); and Rodrigo Diaz Ruiz de **Isla,** whose tractate of 1542[18] first advanced the theory of American origin of the disease. In the delineation of typhus fever and diphtheria, Spanish physicians took the lead. The first account of *tabardillo* or endemic typhus came from the New World, in the *Opera medicinalia* of Francisco **Bravo** (Mexico, 1570), and was later elucidated in Spain through the monographs of Alonzo López de Corella, of Luis Mercado and of Luis de Toro, all published in 1574. There were six epidemics of diphtheria in Spain during 1581-1638 and the disease was first described by Casales, Fontecha and Villa Real in 1611. These three tracts were followed by a number of valuable epidemiologic studies, the most exhaustive of which were those of Alfonso Nuñez de Llerena (1615), Jeronimo Gil Pina (Zaragoza, 1636) and Pedro Miguel de Heredia (1665). Phthisis was elucidated in a chapter of the *Tribunal Apollini* (1568) of Cristobal Pérez de Herrera, hydrophobia in the valuable monograph of Juan Bravo (Salamanca, 1571), melancholia and epilepsy by Andrés Velázquez (1585). The first book on massage was the *Enchiridion* (Zaragoza, 1589) of Bernardino Gómez Mendes, Bishop of

[17]Lopez de Villalobos: *El licenciado Villalobos sobre las contagiosas y malditas buvas.* Salamanca, 1498.

[18]Isla: *Tractado llamada Fructo de todos los Santos contra el mal serpentino venido de la Isla Española.* Seville, 1542.

Albarracin. The first work on the mineral waters of Spain was the *Espejo cristallino de las aguas de España* (Alcalá, 1697) by Ildefonso Limón Montero. The problem of unemployment and public charity was first handled in the *De subventione pauperum* (Bruges, 1526) of the celebrated humanistic philosopher Juan Luis **Vives** (1492-1540), who was imprisoned by Henry VIII for his defence of Catherine of Aràgon, and who proposed first hand observation of nature *vs.* blind submission to the ancients a century before Bacon, and, with Paez de Castro, revived Herodotus' view that history should not be limited to a trite chronologic narrative, but should deal with every aspect of social life (*Culturgeschichte*).

Another great work of humanitarian endeavor was the method of teaching the deaf and dumb devised by the Benedictine Pedro **Ponce de Leon** (1520-84), which is preserved in the *Reducción* (Madrid, 1620) of Juan Pablo **Bonet**. The first book on spectacles was the *Uso de los antoios* of Benito Daça de Valdes (Seville, 1623).

The leading Spanish medical men of the Golden Age were Laguna, Mercado, Valles and Lobera de Avila.

Andrés **Laguna** (1499-1560), of Segovia, studied at Salamanca, Paris and Alcalá, graduated at Toledo (1539), accompanied Charles V on his campaigns in the Low Countries, rendered good service at the siege of Metz, renewed his studies at Padua (with Columbus) and Bologna, and became physician to Popes Paul II and Julius III. He discovered the ileocæcal valve, which is described in his compend of dissecting (1535),[19] published a pest-tract (1542), a system of dietetics for poor students and paupers (1547), a method of excising caruncles of the bladder (1543)[20] and a treatise on diseases of the joints, with a translation of the *Tragopodagra* of Lucian (1551), and was an industrious commentator of Galen (1551) and Dioscorides (1554). He wrote a life of Galen (1548) and an epitome of his writings (1551). His annotations on Galen were highly commended by Haller.

Luis **Mercado** (1525-1611), of Valladolid, whose portrait by El Greco hangs in the Prado, was physician to Philip II and Philip III, wrote on therapeutics (1572), malignant fevers (1574), diseases of women (1579), pulse (1584), institutes of medicine and surgery (1594), diseases of the liver, spleen, kidneys and bladder (1594)[21], practice (1604), hereditary diseases (1605), care and diseases of children (1611),[22] the nature of fever (1611). He also published one of the many Spanish accounts of plague (Madrid, 1599) and diphtheria (1614) and directions for the official examination of the *algebristas* or bone-setters (Madrid, 1599),[23] which was reprinted in Latin at Frankfort (1624). As a medical philosopher, his masterpiece was his *De veritate* (1604), for which he was called the Thomas Aquinas of medicine, a distinction hotly contested by Sprengel.

Francisco **Valles** (1524-92), of Covarrubias (Burgos), called the Spanish Galen and the "divine Valles," was a graduate of Alcalá (1553), who through

his commentaries on Hippocrates, Aristotle and Galen, did much to spread the taste for Greek medicine, as evidenced by the innumerable reprints of his learned annotations. Sprengel regards him as the ablest expounder of Arabic and Arabized medicine. He wrote on medical controversies (Alcalá, 1564), urine, pulse and fevers (Alcalá, 1569), therapeutics (Venice, 1589) and a tract on distilled waters (Madrid, 1592). His reputation as a medical philosopher is based upon his *Sacra Philosophia* (Lyons, 1588), a rational exegesis of the Bible.

Luis **Lobera de Avila**, who accompanied Charles V on all his campaigns and travels, is notable as the author of a book on personal hygiene and sterility male and female (Valladolid, 1551), which contains the first Spanish contribution to pediatrics. The original of this *Regimiento de salud* was published apparently before 1531, since it exists in a German translation of that date. The Spanish text of the pediatrics is surrounded by a garbled version of the Latin text of Bagellardo (Still). Avila also wrote on anatomy (1542), a pest-tract (*circa* 1542), a book on diseases of sudden impact (*De morbis subitaneis*) and one on the four diseases of courtiers, viz., catarrh, gout, stone (vesical, renal and hepatic) and syphilis (Toledo, 1544).[24] The section on syphilis recommends mercurial inunctions and was reprinted in Latin translation by Luisinus (1560).

Akin to Vives and Valles in spirit is the group of medical humanists and philosophers, of whom two surgeons, Amatus and Zacutus Lusitanus, Isaac Cardoso (*Philosophia libera*, 1573), Rodriguez de Castro, Luis de Lemos and Francisco Sanchez (1552-) were of Portuguese Jewish origin, educated in Spain.

Of this group, Antonio Gomez Pereira (1500-) was such an effective opponent of Galen, that his masterpiece, the *Antoniana-Margarita* (Medina del Campo, 1554) was almost entirely destroyed by perfervid Galenists. A pioneer work in pedagogics, phrenology, and vocational aptitude is the *Examen de ingenios para las ciencias* (1557) of Juan de Dios Huarte y Navasco. The *Nueva filosofía* (Madrid, 1587), an analysis of human passions which passed through many editions, is attributed on the title-page to Doña Oliva del Sabuco, but was really written by her father, Miguel Sabuco y Alvarez.

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[19]Laguna: *Anatomica methodus.* Paris, 1535.

[20]Laguna: *Methodus cognoscendi extirpandique nascentes in vesicae collo carunculas.* Venice, 1543.

[21]Mercado: *De jecoris, splenis, renum et vesicae morbis, eorumque curatione.* Madrid, 1594.

[22]Mercado: *De morbis puerorum,* Valladolid, 1611. *De puerorum educatione, custodia et providentia.* Valladolid, 1611.

[23]Mercado: *Instituciones que su Magestad mando hazer al Doctor Mercado para el aprovechamiento y examen de los algebristas.* Madrid, 1599.

[24]Lobera de Avila: *De las quatro enfermedades cortesanas.* Toledo, 1544.

The *Restitutio Christianismi* (Vienne, 1553) of Miguel Servede or Servetus (1509-53), of Villaneuva (Aragon) contains his memorable account of the pulmonary circulation.

From the New World came the description of its plants in the *Sumario* (Toledo, 1525) of Gonsalvo Ferdinando de **Oviedo** y Valdez (1478-) and the *De las drogas de las Indias* (Seville, 1565) of Nicolas **Monardes**. The mountain sickness of the Andes was described by the Jesuit traveller José **d'Acosta** (1540-99), of Medina del Campo, in his *Historia natural y moral de las Indias* (Seville, 1590), which was translated into English (London, 1604). The medicinal plants of the East Indies were described in the *Coloquio dos simples e drogas* (Goa, 1563) of the Portuguese naturalist Garcia de **Orta** and the *Tratado de las drogas* (Burgos, 1578) of Cristobal **Acosta** (-1580).

During the 16th Century, universities were founded at Valencia (1500-1), Santiago (1504-26), Seville (1502), Toledo (1518), Granada (1531-7), and Oviedo (1574, opened 1608). In the 17th Century, Fernández de Navarrete records that there were 34 universities in Spain.[25]

The University of Madrid was slowly evolved from the Colegio de Doña Maria de Aragon, founded in 1590, and ultimately fused with the ancient university of nearby Alcalá in 1836-7.

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[25]As far as ascertainable, these were at Palencia (1212-14), Salamanca (1215-43), Huesca (1255-1354), Lerida (1300), Valladolid (1346), Barcelona (1450), Siguenza (1472), Zaragoza (1474), Avila (1482-1807), Mallorca (1483; 1697), Alcalá de Henares (1499), Valencia (1500-1501), Seville (1502), Santiago (1504-26), Osuna (1515), Toledo (1518-20), Granada (1531-7), Lucena (1533), Bueza (1533; 1565), Sahagún (1534), Oñate (1542), Gandía (1547), Osme (1551), Almagro (1553), Oropesa (1553), Orihuela (1568), Tarragona (1572), Oviedo (1574; opened 1616), Vich (1599), Pamplona (1608), Gerona (1617), Solsona (1617), Tortosa (1645) and Irache. By the legislative reforms of 1857, these were reduced to 10 university districts, viz., Madrid, Barcelona, Granada, Oviedo, Salamanca, Santiago, Seville, Valencia, Valladolid and Zaragoza. On account of the long intervals between the successive charterings by Popes or Emperors, the subsequent dates of reorganization *longo intervallo* and other details, it is impossible to assign definite dates of origin to many of the mediæval and Renaissance universities. But many of the Spanish universities, little known to the historian, e.g., those at Oñate (Guipúzcoa), Baeza or Tortosa, were ornate structures of magnificent architectural design.

In the 17th Century, Spanish poetry, fiction and painting rose to a great height through the work of Lope de Vega and Velázquez (both born in Madrid), Cervantes (Alcalá) and Velázquez (Seville). **Cervantes and Velázquez** are related to medicine with reference to the depiction of border-line mental states: Cervantes through his moon-struck knight, Velázquez in his representations of achondroplasic, cretinoid, hydrocephalic and rachitic dwarfs and of idiocy. To this group of paintings belongs also Ribera's paralytic boy (Vienna Gallery) and Careño de Miranda's representation of endocrine obesity (Prado).

The great Spanish tradition in **bibliography** started with the *Bibliotheca hispana nova* (1672) *et vetus* (1696) of Nicolas **Antonio** (1617-84) of Seville, a tradition which was to be fruitful of colossal achievement in the Western Hemisphere and rivalled by the work of the Spanish cartographers only.

In the so-called *Geisteswissenschaften,* the writers of the 16th-17th Century Spain, were not only original but influential. In international law, Vitorio and Vázquez antedated Grotius, who acknowledges his debt to them. The *Política Indiana* (1629-39) of Solórzano was a great treatise on colonial government and finance. Long before Adam Smith, Martinez de la Mata announced that labor is the only true source of wealth, and the Proudhon-Soviet doctrine of the control and redistribution of private property by the state was ancient history to Luis Vives. Juan Páez de Castro (died 1570), chronicler to Philip II (1555), not only recommended that the king start a library in the Escorial,[26] but began it by donating his own collection of rare books and codices. His *Memorial de las cosas necesarias para escribir historia,* posthumously printed, formulates the program of the modern social, cultural and psychologic historian. The *Brevissima Relación* (Seville, 1552) of the colonial evangelist Bartolomé de las Casas

[26]Páez de Castro: *Memorial sobre la utilidad de juntar una buena biblioteca.*

(1474-1566), which files his famous protest against cruelty to the Indians of the New World, is a humanitarian document of the first order.

The Period of Decadence (1700-1800)

With the accession of Philip V (1700-1746), grandson of Louis XIV, the Hapsburg dynasty came to an end and the Bourbon began. The Spanish monarchs of the 18th Century were a series of "enlightened despots," whose able ministers and financial advisers tried to avoid war, where possible, and were thus able to recoup the depletion of the national treasury by reforms and economies, which brought about an interlude of relative prosperity, until the whole edifice was thrown to the ground again by the ruthless policies of Napoleon. Gibraltar was lost to England by the war of the Spanish succession (1700-13) and Philip V, under the sway of his second wife, Isabel Farnese of Parma, was again involved in expensive intrigue for Italian dominions; but he had the good sense to leave finance (*hacienda*) to the able Jean Orry, as did his successor, Ferdinand VI (1746-59) with his ministers, Enseñada and Wall. The same policies were pursued by Charles III (1759-88), the most enlightened of the group, who was guided by such strong and stable advisers as Aranda, Campomanes and Floridablanca. When the inept and sluggish Charles IV (1788-1808) dismissed Aranda and Campomanes in favor of Manuel Godoy, the trivial lover of Maria Louisa, the time was ripe for the political chaos and bloodshed of the Napoleonic period, with the long sequel of misrule, palace intrigues, insurrections and Carlist wars which followed up to the accession of Alphonso XIII. The maritime power of Spain was broken at St. Vincent and Trafalgar and her military power by Napoleon. Her South American colonies acquired independence one by one and were protected from European intervention by the Monroe Doctrine (December 2, 1823) and the support given the principle by George Canning in the House of Commons. Thus Spain lost colony after colony, and the relative prosperity engendered by the shrewd finan-

cial policies of her able ministers was again dissipated by the expenses of another century of senseless warfare and the equally wasteful expenditures of the court. The poverty and misery of the people engendered continual revolt and the invasion of the country by foreign soldiery initiated a carnival of rape and virtual murder of defenceless civilians. The ablest Spaniard of the time would seem to have been the great painter Goya, who satirized the contemptible spirit of the period with merciless precision. But a new spirit arose when the people of Spain revolted in mass against Napoleon, who was thrown out of the country as much by this guerilla warfare as by Wellington's infantry. The battle of Vittoria (1813), which anticipated Leipzig (1813) and Waterloo (1815), was regarded as so momentous in Central Europe that it was celebrated by a symphonic overture of Beethoven, played at the Congress of Vienna (November 27, 1814). The intrigue of the Spanish marriages and the subsequent reign of Isabella II (1843-68) was a prolonged political farce, and the loss of the Spanish Antilles and the Phillipines in the Spanish American war (1898) proved to be the term and end of decadence and ushered in the dawn of a new day. The uprising of the whole people of Spain against the tyranny of Napoleon on May 2, 1808 (*Dos de Mayo*) is now celebrated annually as their Independence Day.

Thus, even before the Golden Age, the germs of decadence were sown when Ferdinand of Aragon embarked upon the perilous policy of invading Italy for prestige and domination (1497). The defeat of the Invincible Armada (1588) and of the hitherto invincible Spanish infantry at Rocroy (1643) were already premonitory of Trafalgar. Yet to the middle of the 17th Century, Spain held her own fairly well in respect of intellectual production, while her period of decadence, although one of relative financial prosperity, was characterized by a creditable array of representatives in all branches of science, the fine arts and industry, none of whom had any decisive effect upon European culture except the great painter Goya, certain geog-

raphers and cartographers, and Manuel García, the teacher of singing who invented the laryngoscope (1855).

The 18th Century was a period of reform in medical education and public health administration as well as in finance and government.

An epidemic of plague in 1720 led to the formation of a National Board of Health (*Junta suprema de salud*), which was suppressed in 1740 and 1805, to be revived in 1743 and 1807 and reorganized in 1847. Close upon the expulsion of the Jesuits (1767), certain reforms in university reorganization were instituted, which resulted in better anatomical teaching at Granada (1777) and Valencia (1787). In this period, the status of anatomy, surgery and clinical medicine has been regarded by the Spanish medical historians as deplorable. In 1748, the first *Colegio de cirugía in Spain* was opened at Cadiz, another was created by royal mandate at Barcelona in 1760 (opened 1764), and a third at Madrid in 1778 (opened 1787). By a royal order of March 16, 1795, two chairs of clinical medicine were established in the Hospital general at Madrid, and similar courses were instituted at Valencia (1787) and Barcelona (1797). The Royal Spanish Academy was founded at Madrid in 1713 and the *Real Academia Nacional de Medicina* in 1733. The **first Spanish medical periodical**, the *Efemérides barométrico-médicas matritenses* (1734), was the literary organ of this Academy. Its title emphasies the attention paid to medical meteorology by the 18th Century physicians. The Museo nacional de ciencias naturales (Madrid) was founded in 1771.

With reference to consequential position in the general history of European medicine, the leading Spanish physicians of the period of decadence were Gaspar **Casal**, who first described pellagra (*mal de la rosa*) in his *Historia Natural y Médica del Principado de Asturias* (1762); the surgeon Antonio **Gimbernat** (1734-1816), who, in 1768, devised a new operation for femoral hernia turning upon his discovery of the ligamentous structure in the crural arch which goes by his name; and the toxicologist Mateo José **Orfila** (1787-1853), of Mahon (Minorca), who studied at Valencia and completed his medical education in Paris, where he became Dean of the Paris Medical Faculty (1830), published well-known treatises on toxicology (1813-14), medical chemistry (1817), first aid (1818) and medical jurisprudence (1823-5) and played a leading and sometimes dramatic rôle in the trials and poisoning episodes of his period. Gimbernat, in 1768, also discovered

the Clocquet ganglion in the femoral ring, which he demonstrated to John Hunter in 1775 and described fully in 1793. In 1777, when Hunter was dilating on the dangers, incident to operating for femoral hernia, Gimbernat demonstrated to him his new method, which won from the Scotch surgeon the commendation: "You are right, sir. I will describe it in my lectures and will use it whenever I have occasion to operate on the living."

Of more local prominence and importance in the advancement of the national medicine was Pedro **Virgili** (1699-1776), the principal reformer of medical education in 18th Century Spain.

The son of a humble Catalan farmer, Virgili tilled the fields up to the age of 14, when he got a position as a barber-surgeon in the hospital at Tarragona, and after three years experience with venesection, proceeded on foot to Montpellier to begin his medical education. Here he devoted himself mainly to dissection and completed his studies in Paris. Returning to Spain, he was made Chief Surgeon of the Tarragona Hospital and a little later surgeon to the Royal Navy. He played a prominent part in the actions off Gibraltar and Oran and his account of a successful tracheotomy in the hospital at Cadiz was deemed worthy of publication in the Memoirs of the Royal Academy of Surgery at Paris (1743). He became physician to Ferdinand VI, which gave him his opportunity. At this time, the Spanish Navy was manned by foreign surgeons and when the Marquis de Enseñada decided to enlarge the fleet, Virgili laid his plans to set off this deficiency by the foundation of a College of Surgery for the Navy. He chose Cadiz, where he had a building constructed with complete laboratory and surgical equipment, at the same time sending medical students of unusual aptitude to Paris, Bologna, Leyden and London. In two years time (1748), his College of Surgery was opened with a personnel of 12 professors and 50 salaried internes, who were later increased to 100. The institution was in fact a surgical seminary, which became so successful that Virgili in 1758 secured royal permission to erect a similar College for Army Surgeons at Barcelona, which was completed and opened six years later (1764). Here fifty graduate internes were trained annually and to relieve the institution of any dependency upon the University or medical officialdom, it was put under the military command of the Captain General of Cataluña. This was the Declaration of Independence of Spanish surgery. From 1764 on, the medical confraternity of SS. Cosmas and Damian was forbidden to license surgeons. The most distinguished interne of the College at Cadiz was Gimbernat, who was entered in 1758 and, at Virgili's instance, was made professor of anatomy there in 1762.

Nearly forty years intervened between the opening of the College of Surgery at Cadiz (1748) and that at Madrid (1787) but in this period there was marked improvement in the quality of Spanish anatomy and surgery. The medical celebrities of the first half of the century were either confirmed hide-bound Galenists or closet anatomists, who did no dissecting.

Of the older dispensation were Solano de Luque (1685-1738), author of *Lapis Lydius Apollinis* (1731), a Galenic consideration of the varieties and subvarieties of the pulse; Martin Martinez (1684-1734), a highly cultured physician who was aware of the deficiencies in medical education and incurred bitter enmity by attempting to correct them, but whose *Noches anatomicas* (Madrid, 1723-50) and *Anatomia completa* (Madrid, 1730) is regarded by the Spanish medical historians as far inferior to the work of Valverde de Hamusco; Francisco Lloret y Marti, an exaggerated Galenic astrologer, who held the chair of anatomy and mathematics at Valencia for twelve years but wisely gave it up to become a titled functionary in Bilbao; and Andres Piquer (1711-72), who held the same chair at Valencia in 1742-51, during which time he devoted himself to the composition of books on physics (1745), and logic (1747) but ignored anatomy. He was a talented polyhistorian, whose treatise on fevers (Valencia, 1751-77) was translated into French and whose trilingual anthology of Hippocrates (Madrid, 1757-81), giving the Greek text with Latin and Spanish translations, was even more highly esteemed.

Of more scientific importance were

José **Quer y Martinez** (1695-1764), an army surgeon who revived Spanish botany in *Flora española* (1772), whom Linnaeus honored by naming the genus *Queria* after him and who wrote a pamphlet on the treatment of renal colic with uva ursi (1775); José Alsinet who wrote on the use of quinine in paludism (1774); the medical mathematician Antonio **Capdevila**, who corresponded with Haller and furnished him the Spanish data for his bibliographies; and two students of yellow fever, viz., the highly educated and combative Ignacio Maria Ruiz **Luzurriaga** (1736-1822) and José **Masdevall**, inspector general of epidemics in Catalonia, whose *Relacion de las calenturas putridas* was published in 1784-6.

The stimulating effect of the three colleges of surgery is sensed in the work of such men as

Leonardo **Galli**, author of a monograph on fractures of the patella (1795); Queralto and Rives, professors of surgery in the Madrid College; Jaime **Bonells** and Ignacio **Lacaba**, whose treatise on anatomy (1796) became the standard text-book in Spain for nearly half a century; Diego **Velasco** and Francisco **Villaverde**, whose treatise on operative surgery (1780) enjoyed

an equal popularity; Francisco Salvat y Campillo (1751-1828), champion of variolation and student of scurvy and yellow fever; Pedro María González (1763-1837) author of a treatise on naval medicine; Juan Palarea, called *el Medico,* who became a colonel of guerillas in the uprising against Napoleon; and the medical historian Antonio **Hernández Morejón** (1773-1836), who also served as a medical officer in the Army.

THE NINETEENTH CENTURY

The first notable achievement in the 19th Century was the introduction of **vaccination** into Spain by Francisco **Pigillem**, who vaccinated three children at Pingcerdá in December, 1800.

He was followed by Gil y Albeniz in Rioja (1801), Pedro Martin in Cadiz, Luzurriaga and Zunzunegin in Madrid and Hernández Morejón in Valencia. It was then decided to carry the method to the New World. An expedition, headed by Francisco Xavier **Balmis** (1753-1819) was organized by a royal mandate of June 6, 1803 and carried the practice to all the Spanish possessions in the New World and in Asia. In Cuba, it was found that vaccination had already been introduced by Tomás Romay, but Balmis drew up the plan for a Central Vaccine Station (*Junta central de vacuna*) in the island. Upon his return, he was made Inspector General of Vaccination in Spain and the Indies and devoted the rest of his life to this detail. He published a book on the medicinal virtues of the roots of the agave and begonia (1794), which was translated into German (1797).

Prominent among the medical reformers of the early period were

Pedro Castelló y Ginestá (1770-), professor at the College of San Carlos (1801) and physician to Ferdinand VII (1825), who was influential in bringing about the reforms in medical education of 1827 and the laws creating the Junta Superior regulating medical practice, the reforms in the army medical service, the mineral baths and the Academy of Medicine.

Pedro **Mata** y Fontanet (1811-73) of Reus (Tarragona) was imprisoned and twice banished for his political activities, coming under Orfila in Paris, and finally settling down as a government official in Madrid (1843-54), where he drew up plans for reforming medical education which were hotly discussed. He was again active in the September revolution of 1854, which brought him important preferment. He was professor of legal medicine in the Madrid Faculty and his most important work is his treatise on the subject (1844), which passed through five editions. Mata was a temperamental doctor, author of several novels, one of which (*Eloisa y Abelardo*) was suppressed.

Mateo **Seoane** (1791-1870) was driven by his political activities to spend the greater part of his life in England, where his services to public hygiene,

in particular during the cholera epidemic, were such that he was liberally recompensed by the government and admitted to the London Society of Medicine, the Royal Institute of Great Britain and the Royal College of Surgeons. He founded the London *Athenaeum* and compiled the well-known Spanish-English Dictionary (1830) which is still used: Returning to Spain in 1834, he drafted the prospective sanitary legislation of 1837 and during the remaining thirty years of his life, there was no advance in education, public hygiene or social welfare of which he was not the principal prime-mover.

The most active propagandist for the study of public hygiene was Pedro **Monlau y Roca** (1808-71) of Barcelona, who served in the army (1833-47), the Board of Health (1847-71) and came to the chair of hygiene in the Madrid Faculty in 1854. His principal contributions were treatises on public hygiene (1847), marital hygiene (1853) and industrial hygiene (1856), and a number of humorous writings, such as his one-act comedy on quackery (*Lo que es un curandero,* 1830).

The Spanish **anatomists** of the 19th Century derive from the famous text-book of Bonells and Lacaba (1790), which was in use up to 1850, and from the dissections of Gimbernat and Lacaba in the Colegio de San Carlos (Madrid). From Gimbernat stemmed the long line of anatomists and surgeons of the Madrid Faculty:

Up to 1830, Argumosa, Castelló, Roca y Gutierrez and Hisera; during 1840-60, Sanchez Toca, Corral, Viñals, Fourquet; and in the later period Martinez Molina, Villanueva, San Juan, Creus, Velasco and Calleja; in Granada, San Juan Oloriz, Creus, Ribera; in Valladolid, Calleja and Salvino Sierra; in Valencia, Llobet, Zurriaga, Gomez; in Barcelona, Letamendi; in Cadiz, Rubio y Gali, who taught the Dominguez, Amettlers and Benjumedas; in Santiago, Freire, Teyero and Romero Blanes; in Zaragoza, Vega y Lozano and Cajal.

Of this line of apostolic succession from Gimbernat to Cajal, the most remarkable were

Federico **Rubio y Gali** (1827-1902), who made his modest dissecting room at Cadiz famous for accurate and solid practical work; Juan **Fourquet** (1807-65), of Madrid, who came to the Madrid chair in 1848, discovered the stylo-auricular muscle, corrected many errors in classical anatomy, particularly of the locomotor and vascular systems, made a topographical chart, created the Iconographic Museum of the Madrid Faculty (1853), and left his modest fortune to establish an annual anatomical prize of 500 pesetas for second year students; Pedro Gonzales de **Velasco** (1815-82), who neither discovered nor wrote anything, but impoverished himself by squandering his immense fortune of 3 million reales on the erection of a Museum of Anthropology (1875)[27] and Medical Studio for the Madrid

Faculty. He has been canonized in a biographical eulogy by his pupil, Angel Pulido (1894); Federico **Olóriz** y Aguilera (1855-1912) of Granada, who founded the Craniological Museum in the Madrid Faculty, containing 2,250 skulls with complete authenticated data in each case, published studies on the geographic distribution of the cephalic index, based on 8,368 measurements (1892), on height (1896), longevity (1898) and illiteracy (1900) in Spain, and a manual for the identification of delinquents (1911); José de **Letamendi** y Manjarrés (1828-97) of Barcelona, who wrote on criminology (1883), origins of handwriting (1885), a Course of General Pathology (1883-9), a Course of General Clinics and who was also a versatile painter and musician and composer of a requiem mass, which is sung in the Monastery of the Escorial. Julian **Calleja** y Sanchez (1836-1913) a pupil of Fourquet, taught successively at Granada, Valladolid and Madrid, and wrote several anatomical text-books, including treatises on myology (1872), angiology (1877) and embryology. Marcos **Viñals** (1812-95), of Burgos, demonstrated the origin and course of the chorda tympani in a unique preparation of the internal ear (1841).

The Spanish **surgeons** of the 19th Century make a long list. Spain claims priority for Romero in pericardiotomy (1819), for Rubio y Gali in the Halsted operation for cancer of the breast, for Argumosa (1832) over Dieffenbach (1834) in the performance of blepharoplasty and for parotidectomy without previous ligation of the external carotid (1834); for Ribera (1878) over Estlander (1879) in resection of the ribs for pleurisy (Gustav Simon, 1869), and over Momburg in the use of the abdominal hæmostatic ligature.

At the head of the modern group, García del Real signalizes

Alejandro **San Martin** (1847-1908), professor of pathology and clinical surgery in the Madrid Faculty, who devoted the last decade of his life to the study of experimental vascular anastomosis. A case of extensive gangrene of the foot from obliterative endoarteritis suggested to him the possibility of relieving the obstruction by arterio-venous anastomosis. He

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[27]In this grandiose undertaking, poor Velasco was fleeced by unscrupulous contractors, lost his chair and clientèle, and when at last, reduced to penury, he tried to persuade the Madrid Faculty to purchase his museum, he was snubbed with the inevitable come-back: "Nobody asked you, Sir, she said." Ignored by old friends and patients, he was driven to accept the simple charity of humbler people. This trait of meridional Quixotism, charming in itself, illustrates the shrewd observation of Lord Bacon that the Spaniard is "seeming wise." Another hobby horse was the continuation of the *faire la guerre* policies of Charles V and Philip II.

performed 40 experiments on 36 dogs, then tried out his method in two cases of gangrene of the foot (1902), but without evading the necessity of amputation. His work was, however, in the new trend of vascular surgery continued by his pupil Goyanes, Jaboulay, Carrel, Wieting and others. In 1898, San Martin devised a method of amputation at the hip-joint.

The leading surgeon of the early period was Diego de **Argumosa** y Obrégón (1792-1865). In his *Resumen de cirugia* (1856) he described and recommended phleborraphy as a substitute for ligation of the veins, although he never attempted the operation himself. Argumosa devised methods of cheiloplasty, perineal urethrostomy (Poncet) and amputation of the hip, excised the parotid gland (1832), the tongue (1835), excised the penis for cancer (1845) and in 1832 performed blepharoplasty. His priority was disputed by Joaquin Hysern (1804-83), who claimed that he had done the temporo-facial operation with success in 1829 and 1833.

At Granada, José **Ribera** y Sans (1852-1912) employed, as stated, the Momburg elastic ligature of the abdomen for hæmostatic purposes, is credited with resection of the ribs for empyema (1878), made a study of 117 cases of hydatids (1908) and devised original methods of trephining (1898), posterior mediastinotomy (1899), total gastrectomy (1902-11), interilio-abdominal amputation (1903-11) and paraperitoneal laparotomy (1908), also a theoretical approach to the pituitary (1910).

Federico **Rubio** y Gali (1827-1902) founded the surgical institute (*Instituto de terapeutica operatoria,* 1880), or Instituto Rubio in the Hospital de la Princesa on the heights of Moncloa (Madrid), was the first surgeon in Spain to perform ovariotomy (1860), hysterectomy (1861), nephrectomy (1874) and laryngectomy (1878), and turned out among his pupils such specialists as Ariza (oto-rhino-laryngology), Svender (genito-urinary surgery), Buisen (neurology) and Gutierrez (gynæcology).

Eugenio **Gutiérrez** y González (1851-1914) was the founder of gynæcology in Spain. He became gynæcologist to the Rubio Institute in 1881 and contributed to all phases of the subject. He was also an able obstetrician and was summoned to deliver the Queen in May, 1907. Another pioneer in gynæcology was Miguel Angel **Fargas y Roca** (1858-1916), who performed the first ovariotomy for cyst (1882) and the first gastro-enterostomy (1895) in Spain.

Salvador **Cardenal** (1852-1927) of Barcelona, was the pioneer of antiseptic surgery in Spain and author of a book on the subject (*Cirugia antiséptica,* 1880).

Juan **Creus** y Mansó (1828-97), like Argumosa, devised methods of cheiloplasty and amputation at the knee-joint (1885).

Melchior **Sanchez de Toca** (1806-80) performed abdominal hysterectomy for uterine tumor (1845), and in the same year, another Spanish marquis, Tomas **Corral** y Oña (1807-82) is said to have performed the vaginal Cæsarean operation introduced by Dührsen in 1898. Priority over Billroth

(1889) and Jaboulay (1894) is claimed for Felipe **Margarit**, of Barcelona, in the performance of the interilio-abdominal amputation at the hip-joint (1888).

The leading **obstetricians** of the period were

Francisco **Cortejarena** y Aldebó (1835-) and the Marquis Andrés del **Busto** (-1899), editor of *España Médica* (1856-66), the organ of the Academy of Surgery, and founder of *Iberia médica* (1857-8).

Prominent also among the **medical journalists** were

the reformer Rafael **Rodríguez Mendez** (1845-1919), rector of the University of Barcelona (1901), who founded the *Gaceta médica catalaña* (1881) and organized the first Spanish Congress of Tuberculosis (1910); Francisco **Mendez Alvaro** (1806-83), founder of the *Boletin de medicina y farmacia* (1834-5) and editor of its successor, *Siglo médico* (1854-83); Matias **Nieto y Serrano** (1813-1903), who founded the *Boletin mensual de novedades médicas* (1841), which became the *Gaceta médica* in 1842, with Fourquet as co-editor, and ultimately fused with the *Boletin de medicina, cirugia y farmacia* (1834-54) to form the *Siglo médico* (1854); and Antonio Valázquez de Castro (1840-) founder of the *Presna médica de Granada* (1879), which became in 1882 the *Gaceta médica del Sur de España.*

Among the earlier **clinicians**, a notable Triton among the minnows was

Vincente **Asuero** Cortazar (1807-73) author of *Terapeutica substitiva* (1850) and reputed to be the leading Spanish physician of his day. The outstanding internist of the later period was Maximo **Teijéro** (1827-1900), who translated several books and was detailed by the king to report on Pasteur's treatment of rabies in 1886. A pioneer in **dermatology** was Benito **Hernando** y Espinosa (-1916), memorable for his self-sacrificing labors during the cholera epidemic of 1885 and his massive report on leprosy in Granada (1884), which drew both Virchow and Neisser to the city. The onstanding authority in dermatology in Spain was José Eugenio **Olavide**, author of a great treatise in three volumes (1871-80) and of clinical studies on the herpetic and rheumatic dermatoses. In the field of diseases of the ear, nose and throat, Ramon de la **Sota** y Lastro (1834) founded the *Instituto de otorhinolaryngologia;* Ricardo **Botey**, author of clinical studies (1891-3) and a textbook (1902), founded the international *Archivos* (1890) devoted to the subject; Vincente **Llorente** y Matos (1857-1916), founded the Instituto Llorente (de microbiológia y seroterapia, 1894), was the first to perform intubation of the larynx in Spain (1896-7), analyzed 3500 cases of diphtheria (1904) and did experimental work on tissue cultivation with Carrel at the Rockefeller Institute (1913). A. Garcia **Tapía** made a notable contribution to **neurology** in his account of partial right-sided and total left-sided hemiplegia allocated to a lesion in the medulla (1905). A similar contribution was made by the ophthalmologist J. A. **Barraquer** of Barce-

lona, who first described progressive lipodystrophy (1906) and devised the well-known procedure for extracting cataract (phakoeresis, 1917). Cayetano del **Toro**, once a gynæcologist, went over to ophthalmology and became editor of the *Cronica oftalmologica* (Cadiz, 1873-83). Rafael **Cervera** (1828-1903) founded the Casa de misericordia de Santa Isabel (1857) and became director of the Instituto oftalmologico founded by Delgado Jugo. Rodolfo de **Castillo** (1850-) devised a new method of resecting the inferior maxilla (1889) and made a study of Roman ophthalmology (1905), which was translated by Max Neuburger (1907). Of the physiologists, **Pi y Suñer** and Ramon **Turro** were outstanding in Barcelona, and José Gomez **Ocaña** (1860-1919) in Madrid. A pioneer in **pediatrics** was Mariano **Benevente** (1818-85). In the later period, Manuel **Tolosa Latour** (1857-1919) was editor of several pediatric periodicals, translated many foreign books, and founded the seaside sanitarium for tuberculous children at Chipiona, near Cadiz (1897). Among the psychiatrists, José Maria **Esquerdo** (1842-1912) played a gallant part in the cholera epidemics (1865, 1885) and the Carlist wars (1874), founded the famous asylum (Manicomio) at Carabanchel (1877) and was a member of the Cortes during 1893-1900. In medical jurisprudence, criminal anthropology and morbid psychology, the Spaniards, like the Italians, have done good work, in particular Lecha Marzo, Bernardo de Quirós and José Ingegnieros (1877-1925). Antonio **Lecha Marzo** (1888-1919), a medical officer of the Spanish Army (1911), who held the chair of legal medicine at Seville (1914) wrote on such themes as finger prints and scientific palmistry (1912), medico-legal microchemistry and such like, and died prematurely, leaving an unfinished textbook. A precursor of Ramón y Cajal in neurohistology was Luis **Simarra** y Lacabra (1851-1921) founder of the Spanish Association for the Advancement of Science, who held the chair of experimental psychology in the Madrid Faculty. He left his entire fortune and estate, including his splendid library, to the project of founding an Institute of experimental psychology at Madrid. Finally, let mention be made of the dramatist, José Echegaray (1832-1916), whose remarkable plays, often dealing with pathologic and psychiatric themes, won him the Nobel Prize in 1905.

Important reforms in **medical education** and **sanitation** were effected by the Royal Decree of July 4, 1827, uniting the Spanish medical faculties under a single Junta, the plan of Pedro Mata for further reorganization of medical education, confirmed by a Royal order of October 26, 1843, and corrected by the legislation of 1847, which centralized higher public instruction in ten universities, controlled by a Minister of Education, with medical faculties of the first class at Madrid, Barcelona and Cadiz, and of the second class (five year courses) at Valencia, Santiago, Salamanca and Granada. All this was further modified by leg-

islation of 1849-61, up to the law of October 25, 1868. Many mediæval formalities and red-tape obstructions to progress were abolished in the sanitary legislation (*ley de sanidad*) of November 28, 1855.

In **medical history** Spain has a record of very solid performance, as also in **bibliography**, from Nicolas Antonio to Menéndez Pelayo and the achievement of Toribio Medina in Latin America. Of the medical historians,

Antonio Hernández **Morejón** (1773-1836) and Anastasio **Chinchilla** y Piqueras (1801-67) were army surgeons, and Chinchilla, in particular, rendered valiant service in the Carlist insurrection of 1835. Morejón's posthumous *opus magnum*, a Bibliographic History of Spanish Medicine (1852), was published by his literary executors Juan Gualberto Aviles (1799-1865) and Chinchilla, in whose arms he expired in his last illness and who was later accused of ingratitude toward the master by his bitter rival, Aviles. Chinchilla's principal performance is his *Anales históricos* (1841-6), consisting of a general history of medicine (1841-4), a history of surgical operations (1841) and a history of Spanish medicine (1845-6). These works are invaluable for bibliographic reference, worthy successors, in fact, of the *Epidemiologia española* of Joaquin de **Villalba** (1802). The hygienist Luis **Comenge** y Ferrer (1854-) is the author of *Curiosidades médicas* (1886), *Clínica egregia* (1895), medicine in the reign of Alfonso V of Aragon (1903), and notes on the history of Spanish medical culture (1914). Another hygienist, Joaquin **Olmedilla** y Puig has published valuable biographical studies of Andrés Laguna (1887), Nicolas Monardes (1897), Cristobal Acosta (1899) and Vesalius in Madrid (1913). The study of Arnold of Villanova (1879), by Marcelino **Menéndez y Pelayo** (1856-1912), late librarian of the Biblioteca nacional (Madrid) deserves mention here, as also his unfinished history of Spanish science (*La ciencia española*, 1889) and his *Bibliografía hispano-latina clásica* (1902), which represents the work of a lifetime. Apart from the *Bibliotheca* of Nicolas **Antonio** (1672-96), which was reprinted in 1783-88 as a set-off to the *Bibliotheca Lusitana* (1741-59) of Diego Barbosa Machado, the principal bibliographic lists of Spanish literature are the *Diccionario general* of Dionisio Hidalgo (1862-8), B. J. Gallerdo's list of rare and curious books (*Ensayo*, 1863-89), the bibliography of Spanish books of 1401-1833 by Manuel Serrano y Sanz (1903-5), a catalogue of Portuguese authors who wrote in Spanish by Domingo Garcia Perez (1890), a bibliography of Spanish and Portuguese books and translations printed in Italy by Enrico Zaccaria (Carpi, 1907), Mayer Kayserling's list of books by Spanish and Portuguese Jews (Strassburg, 1890), Konrad Haebler's list of Spanish incunabula (1903-17) and Henry Thomas' Short Title Catalogue of Spanish books of 1496-1600 in the British Museum Library (1921). The Junta de iconografia nacional, established in Madrid (1906) for the collection of portraits of national celebrities, has published

an index catalogue of these (*Indice de retratos*) in 10 parts. The respectable tradition for careful bibliography established in Madrid in 1672 has been more than surpassed in the New World. Printing was begun in Mexico in 1539, a century before the Bay State Psalm Book (1640) saw the light, and the first Mexican medical book (1570) antedated Thomas Thacher's broadside on smallpox (Boston, 1677) by 107 years. Mexican literature of the 16th Century has been catalogued in the indispensable *Bibliografia mexicana* of José Garcia **Icazbalceta** (1886-1903), that of the 17th Century by Vicente de **Andrade** (1900), that of the 18th Century by Nicolas **León** (1902-7), the medical historian and anthropologist of Mexico, whose work is based entirely upon original sources in his own country and whose *Adiciones* to Icazbalceta (1903) comprise 116 rare Mexican books printed between 1593 and 1600. In addition, José Mariano Beristain y Souza is author of a bibliography of South American literature by 4000 authors (1883-97) and José **Toribio Medina** has published a history of printing in Mexico during 1539-1821 (1907-9) and special studies of early printing (1904) in Guadalajara (1793-1821), Merida (1813-21), Oaxaca (1720-1820), Puebla de los Angeles (1640-1821) and Vera Cruz (1794-1822). Toribio Medina is, in fact, the leading bibliographer of Latin America. He is the author not only of a bibliography of Spanish American literature of 1493-1810 (1898-1907) but also special histories of printing in Argentina (1892), Chile (1897-99), Bogotá, Colombia (1904), Havana, Cuba (1904), Quito, Ecuador (1904), Guatemala (1910), Paraguay (1892), Lima, Peru (1904-7), Montevideo, Uruguay (1892) and Caracas, Venezuela (1914). Bolivian literature has been catalogued by J. R. Gutierrez (1875-80) and G. R. Moreno (1879-1900), that of Brazil by I. F. Da Silva (1858-1911), A. V. A. S. Blake (1883-1902), and J. C. Rodriguez (1907), that of Chile by Louis Montt (1904-20), that of Colombia by I. Laverde Amaya (1882-95) and Eduardo Posado (1917), that of Cuba by Carlos M. Trelles (1861-1918), that of Ecuador by F. González Suárez (1917), that of Guatemala by J. E. d'Oryan (1917), that of Peru by R. Moreno (1896) and C. A. Pret (1903), that of Uruguay by B. Fernández y Medina (1900) and Dardo Estrada (1912), that of Venezuela by Manuel Segundo Sánchez (1910-4). The leading bibliographer of the Philippine Islands was Wenceslao Emilio **Retana**, who catalogued the books (1895-1905) and printers (1908), while Toribio Medina catalogued 420 books printed in Manila during 1593-1810.

To do more than outline the extension of Spanish medicine in the Spanish colonies is beyond the scope of the present survey. Mexico had the first hospital (erected by Cortez, 1524), the first chair of medicine (1578-80), the first medical publications (1570, 1578) and the first medical periodical (*Mercurio volante,* 1772) in this hemisphere. Universities were started at San Domingo (1538), Mexico (1551), Lima (1553, Medical Faculty 1638), Manila (1601,

Santo Tomas 1611) and Caracas (1725), to name only the oldest, but the development of medicine in these Spanish colonies is, for the most part, shrouded in darkness and awaits its historians. Apart from the superlative work of Nicolas **León**, the only investigation of adequate dimensions which has thus far been published is the history of medicine in Uruguay by Rodolfo **Schiaffino** (Montevideo, 1927).

Mention need only be made of the *res gestae* of such men as Eduardo Licéaga (1836-1920), Rafael Lavista, Antonio Peñafiel, Estrada and León in Mexico; of Carlos **Finlay** (mosquito theory, 1881), Juan Guiteras (1853-95), Juan Santos Fernandez (1847-1922) and Anstides Agramonte in Cuba; Gaspar Vianna (kala azar), Oswaldo **Cruz** (1872-1917) and Carlos **Chagas** (*Trypanosoma Cruzi*, 1909), Vital Brazil and Amaral (Instituto Butantan) in Brazil; Carlos Malbran and José Penna in Argentina; or José **Albert** (infantile beri beri 1908-24), T. H. Pardo de Tavera (Filipino materia medica, 1892) and Cristobal Manalang (hookworm, malaria) in the Philippines. Under American government, the public hygiene of the Philippines has advanced apace. An excellent beginning in the medical history of the Philippines was made by Anastasia Villegas in 1923.[28]

The Twentieth Century

In the 20th Century, Spanish medicine made its first noteworthy contribution to the broad current of European medicine in the work of Santiago **Ramón y Cajal** (1852-) and his pupils.

The son of an Aragonese surgeon, Cajal had in his composition the hardy independence, self-will, tenacity of purpose and long memory of the man of mountaineer stock. Having damaged his health from tropical infections during service as a medical officer of the Spanish Army in Cuba (1874-5), he held in succession the chairs of anatomy at Zaragoza (1877), Valencia (1884) and Barcelona (1887), where he got such results in neurohistology from his modification of the silver-chrome stain invented by Golgi (1880-85) that his appointment to the Madrid chair, coincident with the publication of his great memoir on the retina (1892), was a foregone conclusion. With the aid of his silver nitrate-pyrogallic acid stain (1903), his gold-sublimate stain (1913) and other methods devised by him, he elucidated the finer anatomy of the entire nervous system as never before, and with a single eye to the ultimate rôle of these minutiæ in the dynamics of nervous function. He founded the *Revista trimestral micrográphica* (1897), was ap-

[28] A. Villegas: *Ann. Med. Hist.*, N. Y., 1923, V, 229-241.

pointed director of the *Instituto nacional de higiene de Alfonso XIII* (founded 1900) and in 1903, acquired a Laboratio de investigaciones biologicas (Madrid), which after his retirement, became the Instituto Cajal. He was awarded the Moscow prize of the International Medical Congress at Paris (1900), the Helmholtz medal of the Royal Prussian Academy (1904) and, in 1906, the Nobel Prize, conjointly with Golgi. In 1913-14, Cajal summarized his lifetime of labor in his great treatise on Degeneration and Regeneration of the Nervous System, printed at the expense of Spanish physicians in Argentina and reissued, fifteen years later, in English translation by the Oxford University Press (1928). This deals, as stated, with the minute structural basis of neurodynamics (*anatomia animata*) and its rôle in the transmission of nervous impulses, localization of function, degeneration and regeneration of the neurons and axons of the nerve centers.

In his youth, Cajal had cherished the audacious dream of founding a school of Spanish histologists and he succeeded in a measure probably far beyond his expectations, comparable, indeed, with that of Pavlov in Leningrad. Memorable among the pupils of Cajal are

Nicolas **Achúcarro**, (1851-1918), who devised a stain for connective tissues and worked mainly on the neuroglia; Pio del Rio **Hortega**, who discovered the microglia and oligodendria cells (1919); Francisco **Telló**, who succeeded to Cajal's chair of histology in the Madrid Faculty and has worked on the neurofibrillæ, transplantations of cerebral nerves and regeneration of nerve-endings; Villaverde (neuropathology), de Castro (neuroglia, sympathetic ganglia), Sanchez (comparative neurohistology) and Llorente de Nó (auditory and vestibular nerves).

Finally, Cajal has told the story of his life with straightforward simplicity and charm in his *Recuerdas de mi vida* (1907-17; 2. ed., 1928), while the aphorisms, epigrams and philosophic anecdotes in his *Charlas de café* are among the most pungent and effective to be found in the entire literature of the Latin races. In solid performance, Ramón y Cajal is the greatest figure in the history of Spanish medicine, in point of character, the most eminent man his country has produced in several centuries.

In his autobiography, Cajal laments the "barrier of language" which, in earlier days, stood in the way of a readier acceptance of his work and a similar regret has been voiced by Dr. Eduardo García del Real, professor of history of medicine in the Madrid Faculty, with reference to the gen-

eral ignorance of the outstanding figures of Spanish medicine in Europe and the United States.[29] As the successor of Hernández Morejón and Chinchilla, García del Real has published a history of Spanish medicine (1921),[30] which surpasses any similar record of local medical achievement in any other country. It is a genuine piece of research work, covering nearly 1150 pages, exhaustive, documented, recording with scrupulous fidelity and patriotic devotion every fact and date accessible to its author, with a goodly showing of the cultural achievement of Spain in other branches of science, invention, literature and art.

Yet it is a difficult book to assimilate, partly from lack of a just sense of proportion and literary style and the faulty arrangement of some of the material, but more particularly on account of the lengthy, humorless citations of extravagant eulogy and the apparent failure of the author to strike a balance between what is of definite local importance in Spain and what may be of moment on the broad highway of progressive scientific medicine. With this criterion in mind, he could have said all he has to say in a fraction of the space required, and he might have coördinated his facts and dates to better purpose by stripping down the lengthy eulogies to their bare essentials. The barrier of language, then, lies not in the Spanish idiom itself, which is beautiful, graceful and easy of comprehension, but in the fact that where Spanish poetry is often concise and to the point, Spanish prose, and particularly Spanish scientific prose, is too prone to be diffuse, verbose, florid and rhetorical. The Spanish language is, in fact, a social and artistic, rather than a scientific medium. Yet the spoken idiom, the *chistes* and *coplas,* the national proverbs, the dialogue in Tirso de Molina, the epigrams in

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[29]One necessary and sufficient reason for this spirit of *nil admirari* in the past was the antipathy created among the Northern (Protestant) nations by the Counter-Reformation (Thirty Years War), the Great Armada and the invasion of the Netherlands. The irritation of the people of the Italian principalities against the Spanish viceroys, superimposed by Isabel Farnese, is a leading motive in Stendhal's novel, *La Chartreuse de Parme.*

[30]E. García del Real: *Historia de la Medicina en España,* Madrid, 1921.

the *Charlas* of Cajal are as terse and to the point as the rollicking Gammer Gurton verses of the Arcipreste de Hita or the *Humoradas* of Campoamor, in which not a syllable is wasted. A fair example of the concision of which Spanish poetry is capable is afforded in the sonnet of Castelo y Serra in memory of Argumosa, the most eminent Spanish surgeon in the first half of the 19th Century:

"Grave, severo, mesurado, frio;
Buen esposo, buen padre y ciudadano;
Por su carácter, todo un espartano;
De trato dulce, aunque exterior sombrío.
Como Catón incorruptible, pío;
Correcto en la diccíon, firme de mano;
Como muy pocos, habil cirujano;
A la hora del deber nunca tardío.
Tan pulcro en el obrar como en el traje,
Y docto en escribir castiza prosa
Como en poner artístico vendaje
Despues de hacer operación pasmosa,
Y genio, en fin, de superior linaje,
Tal fué, señores, Diego de Argumosa."

Sophisticates of our flippant post-bellum period may smile at the measured, sober-sided, pedestrian eulogy of these verses, even as pudibond readers of the Victorian "Age of Innocence" would experience horripilation at the sexual cynicism of present day poetry and illustration. Yet judged by the standards of the time in which it was written, the above sonnet is no more lapidary than scores of others of the same period, from Wordsworth or Shelley to Lowell or Swinburne. What it does say to us is that for Spain, too, is apposite the dictum which Mr. Matthew Arnold applied to the literature of our own country: "The glorification of the average man is too much of a religion there." The best one can say of many of the Spanish medical authors cited by García del Real is that they wrote books of average merit on the subjects and specialties in which they happened to be interested. The Fifth Paragraph of Army Regulations, which forbids, "the foolish face of praise" as well as blame, holds up a value seldom appreciated by the historians of science and medicine. The

victim of maladroit laudation by benevolent big-boy enthusiasts at festal dinners and banquets may live to regret the sensible sobriety of more spacious days—

"Ni cet excès d'honneur, ni cette indignité";

or even the acid tests of a more ironic and aristocratic period—

"Go on, dear creatures, make me see
All that disgraced my betters meet in me,"

or

"Is this a dinner? This a genial room?
No, 'tis a temple and a hecatomb,"

or

"I sought no homage from the race that write,
But hid like Asian monarchs from their sight,"

or

"One from all Grub Street doth our fame defend
And (more abusive) calls himself our 'friend'."

The isolation and lack of appreciation of Spanish medicine which García del Real laments is due, in part, to the physical isolation of his country, to the intransigence occasioned by the wars of the Counter-Reformation among Nordics, and to that natural feeling for past glories, which has prevented Spanish historians from evaluating things of merely local consequence with reference to their status (if any) in the larger atmosphere of global medicine. The impersonal scientific contributions of such men as Cajal, Achúcarro, Hortega, Tapía and Barraquer have gone far to lift Spanish medicine out of the same tedious provincialism which once obsessed the medical literature of our own country, and prelude, let us hope, the dawn of a newer and fairer day for Spanish science.

CHRONOLOGY OF SECULAR AND MEDICAL HISTORY IN SPAIN

630.	First Greek voyage to Spanish coast.
6th Century.	Scylax refers to Ebro River (Iberus).
550.	Carthaginians enter Spain.
236-228.	Hamilcar Barca enters Spain and founds Barcelona.
219.	Hannibal destroys Saguntum.
206 B.C.-409 A.D.	Roman occupation.
202.	Scipio Africanus defeats Hannibal at Zama (end of Carthaginian dominion).
205 B.C.-14 A.D.	Romanization of Spain.
146 B.C.	Romans destroy Carthage.
A.D.	
306.	First Church Council at Iliberis (Elvira).
409-713.	Visigothic Spain.
554-567.	Athangild establishes Visigothic capital at Toledo.
570-636.	Isidore of Seville.
580.	Bishop Masona founds hospital at Merida.
622.	Conversion of Arabs to Mohammedanism.
711-718.	Moslem conquest of Spain.
711-1031.	Moslem occupation.
732.	Charles Martel defeats Moslems at Tours.
755.	Ommayad capital established at Cordova by Abd-er-Rahman.
755-1031.	Ommayad Dynasty (Cordovan Caliphate).
913-961.	Abd-er-Rahman III (height of Moorish civilization and naval power in Spain).
976-1002.	Almansor.
1031-1276.	Crusade for independence from Moslem rule.
1033.	Monks of Cluny (Benedictines) enter Castile.
1067.	Ruy Diaz (The Cid) founds lazaretto at Palencia.
1085.	Alfonso VI of Castile releases Toledo from Moslem dominion.
1086-91.	Almoravides (Sahara) subjugate Spain.
1086-99.	Ruy Diaz (The Cid) usurps rule of Valencia.
1114-87.	Gerard of Cremona.
1125.	Rise of Almohades in Morocco.
1126-98.	Averroes (Cordova).
1139-1205.	Moses Maimonides (Cordova).
1140.	Archbishop Raimundo founds a school of translators at Toledo.
1146-72.	Almohades subjugate Spain.
1188.	First public assembly (*Cortes*) held in Léon.
1212.	Hospitals at Burgos founded by monks of Cister. Moslems defeated at Navas de Tolosa (Andalusia).
1212-14.	Alfonso VIII founds University of Palencia.
1213-76.	Reign of Jaime I (The Conquerer) in Aragon.
1215.	Alfonso IX founds University of Salamanca. (confirmed 1243; Papal bull 1255).
1230-38.	Establishment of Moslem Kingdom of Granada.
1232-1315.	Ramón Lull.
1236-48.	Ferdinand III of Castile frees Cordova, Murcia and Seville from Moslem domination.
1238.	Jaime I releases Valencia from Moslem dominion.
1240.	Fernando III establishes chair of anatomy at University of Palencia.
1240-1311.	Arnold of Villanova.
1252-84.	Alfonso X ("The Wise").
1252-1479.	Period of development of national unity.
1255.	Alfonso X founds an Academia de Medicina.
1256-65.	Revision of Castilian code of laws (*Partidas*).
1257-73.	Attempt of Alfonso X to become Holy Roman Emperor.
1273.	Rudolph of Hapsburg chosen Holy Roman Emperor.
1282.	Sicilian Vespers. Pedro III of Aragon dispossesses Charles of Anjou in Sicily.
1300.	University of Lerida (reorganized 1575).
1312-50.	Alfonso XI of Castile concentrates royal authority at expense of the nobles.
1322.	Monasterio de Guadalupe (Estremadura) founded, with medical studio and hospital.
1324.	Jaime II of Aragon acquires Sardinia.
1350.	*Amadés de Gaula* circulated in Spain.
1391.	Massacre of Jews in Seville and Barcelona.
1409.	Insane asylum (*Casa de orates*) at Valencia.
1412.	Diego Cobo composes a surgery in rhyme (*Cirugia rimada*).
1422.	Juan II decrees tribunal to examine applicants for right to practice medicine.
1425.	Insane asylum at Zaragoza.
1436.	Insane asylum at Seville.
1450.	University of Barcelona founded.
1458-70.	Catalan revolt.

1468. Ferdinand of Aragon authorizes dissecting in Hospital de Santa Maria de Gracia (Zaragoza).
1469. Marriage of Ferdinand (Aragon) and Isabella (Castile).
1471. Quarantine against plague at Mallorca.
1472. University of Siguenza founded.
1473. Insane asylum at Toledo.
1474. University of Zaragoza founded.
Printing introduced at Valencia by Lambert Palmart.
1477-8. Isabella sends 400 ambulances to siege of Otrera.
1479-1516. Reign of Ferdinand and Isabella.
1481. Insane admitted to asylum at Barcelona.
1481-1518. Spanish Inquisition.
1482. University of Avila founded.
1483. University of Mallorca founded.
Hospital de innocentes (insane asylum) founded at Toledo.
1484-9. Isabella supplies hospital tents at sieges of Alora and Baza.
1490. Antonio Amiguet founds a school of surgery in Barcelona.
1491-1556. Loyola.
1492. Discovery of America. Conquest of Granada. Expulsion of Jews. (March 31).
1494-98. Julian Gutierrez publishes treatises on stone.
1497. Ferdinand acquires Naples (Southern Italy).
Vasco da Gama rounds the Cape of Good Hope.
Gaspar Torrella describes syphilis as *pudendagra* (abuse of mercurials).
1498. Villalobos publishes poem on syphilis.
1499. Pedro Pintor publishes pest-tract.
1500-1665. Age of Gold.
1500. University of Valencia founded. (Reorganized 1582).
1502. Forced conversion of Moors (Mudéjares) to Christianity.
Juan Almenar discusses treatment of syphilis with mercurials, sarsaparilla, guaiac, sassafras and China root.
1504. University of Santiago founded.
1504-6. Reign of Philip the Fair and Juana la Loca.
1506-62. St. Francis Xavier.
1507. Heavy epidemic of plague in Spain.
1507-17. Regency of Ferdinand.
1508. *Amadés de Gaula* published at Zaragoza (influence on European fiction).
1512. Order of Illuminados organized.
1515. Duke of Ureña founds University of Osuna.
1515-82. Santa Teresa.
1516. University of Seville founded.
1516-56. Reign of Charles I.
1517-1618. Reformation.
1519. Charles I of Spain becomes Holy Roman Emperor (Charles V).
1519-21. Cortez conquers Mexico.
1520. Charles V founds University of Toledo as Colegio de Santa Catalina.
1521. Gaspar Torrella publishes *Consilia* on plague epidemic of 1505.
1521-44. Wars between Charles I (Spain) and Francis I (France).
1525. Oviedo describes medicinal plants of New World.
1526. Defeat of Francis I at Pavia.
Luis Vives publishes treatise on unemployment (*De subventione pauperum*).
1529. Gutierrez de Godoy publishes brief for breast-feeding of infants.
1531-2. Pizarro conquers Peru.
1532. *Constitutio criminalis Carolina* (medical jurisprudence).
1534. University of Sahagún founded as a *studium generale* (later transferred to Irache).
1534-82. University of Huesca.
1535. Andrés Laguna describes the ileocæcal valve.
1537. University of Granada founded as Colegio de Santa Cruz (1526).
1539-40. Jesuit order organized.
1540. Luis Vasseo publishes anatomical tables (4) at Paris.
1540-1606. Vittoria (sacred music).
1542. University of Oñate founded.
Ruiz de Isla publishes book on American origin of syphilis.
1542-52. Spanish anatomists theorize about the circulation of the blood.
1544. Lobera de Avila publishes treatise on catarrh, gout, stone and syphilis.
1545-1625. El Greco.
1546. Charles V authorizes publication of first *Index expurgatorius*.
1547. Francesco Borgia, Duke of Gandía, founds University of Gandía (Jesuits).
1547-1616. Cervantes.
1548. Andrés Laguna describes method of excising vesicourethral caruncles.
1549. Pedro Gimeno describes the stapes in *Dialogus de re medica*.

1550. Montaña de Monserrate publishes *Anatomia* at Valladolid.
1551. Bishop of Osma founds University of Osma as a *studium generale.*
University of Lima (Peru) founded.
Lobera de Avila publishes first Spanish contribution to pediatrics.
1552. Las Casas publishes account of Spanish cruelty to the Indians.
1553. Viceroy of Peru founds University of Oropesa.
University of Almagro founded (Dominicans).
University of Mexico founded.
Servetus describes pulmonary circulation.
1556. Valverde de Hamusco publishes treatise on artistic anatomy.
1556-98. Philip II.
1557. Typhus fever (*tabardillo*) appears in Spain.
Juan Huarte completes treatise on vocational aptitude (*Examen de ingenios*), published in 1580.
1558. Charles V renounces crown of Holy Roman Empire.
1562-1635. Lope de Vega.
1564. Francisco de la Reina adumbrates circulation of the blood.
1565. University of Baeza founded.
Porcel described the plague of Saragossa (1564).
1567-1604. War against the Netherlands.
1568. Archbishop of Valencia founds University of Orihuela (Dominicans).
1569-71. Nicolas Monardes publishes accounts of West Indian materia medica.
1570. Francisco Bravo describes *tabardillo* (Mexican typhus).
Epidemic of sweating sickness in Spain.
1571. Philip II wins naval victory at Lepanto.
Castillian Cortes requires degree of bachelor of astrology as essential to medical degree.
1571-1658. Tirso de Molina.
1572. Archbishop of Tarragona founds University of Tarragona.
1574. Torrella and Toro describe Spanish typhus (*tabardillo*).
Amatus Lusitanus describes valves of azygos vein.
1576. Francisco Arceo publishes book on wound treatment.
1580. Heavy epidemic of influenza in Madrid and Barcelona.
1580-81. Annexation of Portugal.
1583. University of Gerona.
Diphtheria (*garrotillo*) epidemic in Spain.
1584. 6778 students at the University of Salamanca.
1584-5. Luis de Lemos publishes commentary on Hippocratic writings.
1585-6. Smallpox epidemic in Toledo.
1587. Drake burns shipping in the harbor of Cadiz.
1588. Trial and execution of Mary Stuart.
Defeat and wreck of Invincible Armada.
Philip II establishes prescriptive rights of protomedicate.
1589. Arceó's book on wound-treatment (1576) translated into English.
1590. Gómez Mendez, Bishop of Albarracin, publishes book on massage.
1594. Acosta describes Andes mountain sickness.
1595. Luis Mercado publishes book on visceral diseases.
1596. Lopez de Hinojoso publishes surgical treatise in Mexico.
1598-1700. Juan Calvo translates Guy de Chauliac into Spanish.
1598-1621. Period of decadence.
1599. Philip III.
1599-1660. University of Vich founded.
1600-1681. Velázquez.
1603. Calderón de la Barca.
Diphtheria epidemic in Spain.
Rodrigo de Castro publishes treatise on diseases of women.
1604. *Don Quixote* (Part I) published.
1605. University of Oviedo founded.
Daza Chacón publishes surgical treatise.
1608. Luis Mercado describes diphtheria (*garrotillo*).
1609. University of Pamplona founded.
1611. Expulsion of Moors.
Cascales publishes pediatric treatise.
Casales, Fontecha and Villareal describe diphtheria.
1613. Luis Mercado publishes treatise on diseases of infants.
1614. Vélez de Arciniega publishes account of animals useful to medicine.
1615. Rodrigo de Castro publishes book on medical ethics.
1617. Second Part of *Don Quixote* published.
University of Solsona.
Philip III orders reexamination of provincial physicians coming into Madrid (November 7).
1618-48. Thirty Years' War.
1618-82. Murillo.
1619. 32 Universities in Spain.
1620. Bonet publishes book on training deaf-mutes.
1622-42. Cardinal Richelieu.

1623.	Daça de Valdes publishes first account of spectacles.
1624.	Philip IV creates Estudios de San Isidro.
1629.	Zacutus Lusitanus publishes book on history of medicine.
1635-59.	War with France.
1637-68.	Revolt and independence of Portugal.
1638.	Zacutus Lusitanus publishes treatise on eye diseases.
	Countess of Chinchon (Peru) cured of malarial fever by quinine.
1639.	Quinine imported into Europe by Juan Lopez de Vega.
1640-59.	Catalan Revolt.
1642.	Pedro Barba describes medicinal virtues of quinine in *Vera praxis.*
1643.	Condé defeats Spanish infantry at Rocroy.
	Dismissal of Olivares.
1643-1715.	Louis XIV (*Il n'y a pas de Pyrenées*).
1645.	University of Tortosa founded.
1647.	Epidemic of plague in Valencia.
1649.	Epidemic of plague in Seville.
1650.	2061 students at the University of Alcalá.
1651-60.	Velázquez depicts dwarfism and idiocy by oil-painting.
1659.	Pyrenees made boundary line between France and Spain.
	Marriage of daughter of Philip IV (María Teresa) with Louis XIV.
1665-1700.	Charles II.
1667-97.	Intermittent warfare with European powers.
1672.	Nicolas Antonio publishes *Biblioteca hispaña nova.*
1681.	Botanic Garden in Barcelona.
1685.	Calderon publishes treatise on criminal jurisprudence.
1696.	Nicolas Antonio publishes *Biblioteca hispaña vetus.*
1697.	University of Mallorca refounded.
	Limón Montero publishes first account of Spanish mineral waters.
1699-1776.	Pedro Virgili.
1700.	Real Academia de medicina y cirugia de Seville founded.
1700-46.	Accession of Duke of Anjou as Philip V (Bourbon line).
1701-14.	War of the Spanish Succession.
1702-48.	Wars with England.
1713.	Real Academia Española founded.
1713-14.	Loss of Spanish possessions in Europe.
	Treaties of Utrecht and Rastadt.
1714-48.	Isabel Farnese gains Italian possessions for her children.
1716.	Biblioteca nacional (Madrid) founded.
1717-18.	Philip V reconquers Sicily and Sardinia.
1724.	Abdication of Philip V.
1733.	Real Academia nacional de medicina de Madrid founded.
1734.	*Efemérides barométrico-médicas matritenses* (first Spanish medical periodical) published.
1734-5.	Re-acquisition of Naples.
1740-48.	War of the Austrian Succession.
1743-54.	Financial reforms of Enseñada.
1746-59.	Ferdinand VI.
1746-1828.	Goya.
1748.	Isabel Farnese acquires duchies of Parma, Plasencia and Guastalla.
1751.	Notification of tuberculosis made obligatory (Royal decree of October 6).
1757.	Use of Botanic Garden (Madrid) for instruction.
1759-88.	Charles III (Conflict with England).
1761-2.	Family compact (defensive alliance of Spain with France against England).
1762.	Gaspar Casal describes pellagra.
1762-3.	Temporary occupation of Philippines by the English.
1763.	Real Academia de ciencias y artes (Barcelona) founded.
1764-86.	War with Moslem states on Barbary Coast.
1768.	Gimbernat devises operation for femoral hernia (Gimbernat's ligament).
1771.	Museo nacional de ciencias naturales founded.
1773.	Real Academia de medicina y ciencias (Barcelona) founded.
1774.	Renewal of Family Compact.
1775-83.	American Revolution.
1777-92.	Ministry of Floridablanca.
1779-83.	War with England.
1781.	Botanic Garden in Madrid.
1785.	Biblioteca universitaria (Valencia) founded.
1788-1808.	Charles IV (Conflict with Republican France).
1790.	Bonells and Lacaba publish standard textbook of anatomy.
1792.	Ministry of Aranda.
1792-1808.	Rise of Manuel Godoy.
1795.	Real Colegio de Medicina (Madrid) founded.
1797.	Dismissal of Godoy.
1799.	Education of nurses begun at instance of Gimbernat.
	Anales de historia natural published.
1800.	Francisco Pigillem introduces vaccination into Spain.

1800-1.	Recession of Louisiana to Napoleon. Tuscany added to Duchy of Parma.
1802.	Joaquin Villalba publishes *Epidemiologia española.*
	Trinidad ceded to England.
1803.	Louisiana Purchase.
	Francisco Balmis introduces vaccination throughout Spanish possessions.
1805.	Nelson defeats French and Spanish fleets at Trafalgar.
	Charles IV approves Regulations for the Surgical Corps of the Army (July 20).
1808.	*Dos de Mayo.* Uprising of Spanish people against Napoleon (May 2).
	Abdication of Charles IV (March 19).
1808-14.	Guerilla warfare against Napoleon (Spanish War of Independence).
1808-33.	Ferdinand VII.
1810-24.	Spanish American Colonies gain independence.
1812.	Democratic constitution.
1813.	Wellington defeats the French at Vittoria.
1814.	Ferdinand VII returns to Spain.
1816-17.	Royal orders creating organization (*Cuerpo de Medicos*) of 31 mineral baths.
1819.	Romero performs pericardiotomy.
1821.	Establishment of 23 medical schools in Spain and Colonies.
1823-9.	Terrorist struggle between absolution and insurrection.
1827.	Royal decree uniting medical faculties under a single *Junta* (July 4).
1828.	Protomedicate and Surgeon Generalcy of Army abolished (December 10).
1829.	Ferdinand VII confirms new Regulations of Army Medical Corps (1805).
	Ferdinand VII marries Maria Cristina of Naples.
	Hysera claims priority in operation of blepharoplasty.
1830.	Dr. Mateo Seoane publishes Spanish-American dictionary.
	Regulations of Army Corps of Pharmacists published.
1832.	Royal order limiting personnel of Medical Corps of Navy to 65.
	Argumosa performs parotidectomy, invents syringotome, and claims priority in blepharoplasty.
1832-99.	Emilio Castelar.
1833.	Coronation of Isabel II.
1834.	Hysern publishes treatise on blepharoplasty.
1835.	*Limpieza de sangre* abolished.
	Argumosa performs excision of the tongue.
1837.	New liberal constitution.
1841.	Marcos Viñals describes origin and course of chorda tympani.
1841-6.	Anastasio Chinchilla publishes History of Medicine.
1843.	Pedro Mata publishes plan for reorganizing medical education in Spain (confirmed by Royal Order of October 26).
1843-68.	Reign of Isabella II (Rule of army generals).
1845.	Academia médico-quirúrgica española (Madrid) founded.
	Corral claims priority in vaginal Cæsarean section.
	Toca claims priority in abdominal hysterectomy for uterine tumor.
1845-7.	Mata edits *La Facultad* (medical periodical).
1847.	Real Academia de ciencias exactas (Madrid) founded.
	Diaz activates reforms in popular and medical education.
1847-9.	New plans for reorganization of medical education.
1850.	Special chairs of venereal diseases, dermatology and ophthalmology in Madrid Faculty (Decree of August 28).
1852.	*Historia bibliográfica de la medicina española* (Hernández Morejón) published.
1850-66.	Royal orders modifying plan of 1847 for improvement of medical education.
1854-83.	Mendez Alvaro edits *Siglo médico.*
1855.	Manuel García invents the laryngoscope.
	Law regulating public health (*Ley de sanidad,* November 28).
1856-66.	Marquis del Busto edits *España Médica.*
1857-8.	Marquis del Busto founds and edits *Iberia Médica.*
1857.	Laws reorganizing public instruction (*ley de Moyano,* July 17).
1860.	Rubio y Gali performs first ovariotomy in Spain.
1861.	Reorganization of Real Academia de Medicina (Madrid).
	Rubio y Gali performs hysterectomy.
1868.	New law reforming public education including medicine (*ley de Ruiz Zorrilla,* October 25-27).
1868-78.	Cuban Revolution.
1870.	Assassination of General Prim.
1870-71.	Franco-Prussian War (Claims of Leopold of Hohenzollern to Spanish throne).
1871-3.	Amadeo of Savoy (Duke of Aosta) as temporary ruler.
1871-80.	Olavide publishes treatise on dermatology.
1871-83.	Toro edits *Clinica oftálmologica.*

1873-4.	Temporary Spanish Republic.
1874.	Rubio y Gali performs first nephrectomy in Spain.
1874-85.	Alfonso XII.
1874-1924.	Growth of caciquism (political bosses).
1875.	Museo Antropológico of Dr. Velasco opened (April 29).
1876.	New conservative constitution.
1878.	Academia i Laboratori de ciencias mediques de Catalunya (Barcelona) founded.
	Ribera claims priority over Estlander (1879) for resection of ribs in empyema.
	Rubio y Gali performs laryngectomy.
1879.	Velázquez founds *La Prensa médica de Granada* (*Gaceta médica del Sur de España* 1882).
1880.	Rubio y Gali founds Instituto de terapeutica operatoria (Instituto Rubio).
1881.	Rodriguez Mendez founds *Gaceta médica catalana.*
1882.	Fargas y Roca performs first ovariotomy in Spain for cystic tumor.
1884.	Hernando y Espinosa publishes report on leprosy in Granada.
1885.	Instituto nacional de higiene militar (Madrid) founded.
1885-1902.	Regency of Maria Cristina.
1888.	Margarit claims priority in interilio-abdominal amputation (Jaboulay, 1894).
1892.	Academia de higiene de Cataluña (Barcelona) founded.
1894.	Llorente y Matos founds Instituto de microbiologia y seroterapia (Instituto Llorente).
1895.	Fargas y Roca performs first gastro-enterostomy in Spain.
1896-7.	Llorente y Matos introduces laryngeal intubation.
1897.	Ramón y Cajal starts *Revista trimestral micrográphica.*
1898.	Spanish-American War. Loss of Cuba, Porto Rico and the Philippines
	Revival of economic prosperity.
	San Martin devises osteoplastic amputation at hip-joint.
	Menéndez y Pelayo becomes director of Biblioteca nacional.
1898-1900.	San Martin experiments on surgical arterio-venous anastomosis.
1898-1931.	Renaissance of Spanish literature, art and music.
1899.	Instituto nacional de higiene de Alfonso XIII (Madrid) founded.
	Ribera devises posterior mediastinotomy.
1902.	Sociedad oftálmologica hispano-Americana (Madrid) founded.
1902-31.	Alfonso XIII.
1903.	First Spanish congress of ophthalmology.
	Cajal founds Laboratorio de investigaciones biologicas (Madrid).
	Ribera describes total gastrectomy.
1903-17.	Konrad Haebler catalogues Spanish incunabula.
1905.	Garcia Tapia describes hemiplegic syndrome allocated to a lesion in the medulla.
	Echegaray wins Nobel prize.
1906.	Ramón y Cajal wins Nobel Prize.
	Barraquer describes progressive lipodystrophy.
1908.	Asociación española para el progreso de las ciencias founded.
1909.	Catalonian revolt. Execution of Ferrer.
1910.	First Spanish Congress of Tuberculosis at Saragossa.
1912.	General railway strike. Canalejas invokes martial law.
1913.	Sociedad de biologia (Barcelona) founded.
1913-14.	Cajal publishes treatise on Degeneration and Regeneration of the Nervous System.
1914-18.	Spain maintains neutrality in World War.
1915.	Sociedad oftalmológica (Madrid) founded.
1917.	Barraquer devises method of extracting cataract (phakoeresis).
1919.	Rio Hortega investigates microglia and oligodendria cells.
1921.	Sociedad española de antropologia founded.
1923.	Instituto Alfonso XIII for cancer research (Madrid) founded.
1924.	Liga español contre el cancer (Madrid) organized.
1925.	Sociedad oftalmológica de Barcelona founded.
1931.	Revolution. Organization of Spanish Republic.

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